

# THE DOCK & HARBOUR AUTHORITY

No. 156. Vol. XIII.

OCTOBER, 1933

## Editorial

### *The Port of Savona.*

The Port of Savona, which is situated in north-west Italy in close proximity to the port of Genoa, is chiefly notable as regards coal imports, which is the chief commodity handled.

The port is sheltered by four artificial breakwaters and these have been built out practically parallel with the coast. Improvements have been carried out at various intervals, mainly in connection with the coal handling plant.

The traffic of the port has been very steady during the past few years. The total imports for 1932 were 1,501,000 tons and of this total, coal imports amounted to 1,130,227 tons. Exports have increased rapidly in recent years, but occupy only a very small percentage of the traffic handled as compared with imports.

An illustrated article on the Port of Savona appears in this issue, and Savona also forms the supplement for this month.

### *Port of London Authority: Annual Report.*

The twenty-fourth annual report of the Port of London Authority for the year ended March 31st, 1933, shows a deficit on the year's working of £77,194.

The total net registered tonnage of vessels arriving and departing with cargoes and in ballast for the year was 53,903,886 tons, this being a decrease of over 2,000,000 tons as compared with 1931. The values of the total imports and exports (excluding coastwise goods and transshipments under bond) for 1932 reached £409,371,000, which compared with 1931 when the figures were £492,400,746, shows a decrease of £83,000,000, or 16.9 per cent.

The tonnage of imports and exports, foreign and coastwise, for the twelve months ended March 31st, 1933, totalled 34,321,862 tons, this being a slight increase of 270,000 tons, or .8 per cent. as compared with the previous year. There was a slight increase both in imports and exports, the import figures for 1933 being 28,341,781 tons, an increase of 256,000 tons or .9 per cent. as compared with 1932. The exports totalled 5,980,081 tons for 1933, an increase of 14,000 tons or .2 per cent. over the figures for 1932.

The Port of London Authority landed or received 2,001,890 tons of import goods for warehousing or for immediate delivery during the 12 months ended March 31st, 1933, this being a decrease of 472,283 tons or 19.1 per cent. as compared with the tonnage dealt with for the previous year.

The result of the year's working, as mentioned above, showed a deficit of £77,194 after taking off interest charges from the balance of revenue. The total revenue received was £5,174,963, a decrease of just over £500,000 as compared with the previous year, and the total expenditure was £3,848,247, a saving of roughly £353,000 as compared with the previous year. The balance of revenue over expenditure on the year's working was £1,326,716, which after taking off interest on port stock and temporary loans, sinking fund charges, etc., less interest, etc., receivable, which amounted to £1,403,910, left a deficit of £77,194.

### *Scheme for Strengthening Quay Wall at Aberdeen.*

A scheme for strengthening the quay wall at Aberdeen Harbour at an estimated cost of £7,900 has been recommended by the Works Committee of Aberdeen Harbour Trust. In this connection the Harbour Engineer (Mr. H. R. Barr) has prepared a report regarding a subsidence which took place recently in the roadway at Trinity and Regent Quays. The area affected, it was reported, extended for about 230-ft. in length and about 20-ft. in width, and the depth of the subsidence was about 6-in. It occurred behind one of the old harbour quay walls. Mr. Barr recommends the driving of steel sheet piles in front of the existing quay wall for a length of 320-ft., extending from the timber gusset wharf at Market Street to the bend

in the quay wall east of Shore Brae. The space between the quay wall and the sheet piles would be filled up, and the sheet piles would be anchored back with steel tie rods to concrete anchorages placed under the surface of the quay.

### *Engineer's Plan for Super Canal.*

Mr. B. Walton Maughan, an engineer of Holmfirth, Yorkshire, has put forward the idea, as an unemployment relief scheme, of extending the Manchester Ship Canal to Yorkshire. He suggests the course of this huge waterway should be from Manchester up to Patricroft or Eccles, then branching north-west of Manchester to Rochdale, there to be raised by vertical lift-locks over 300-ft. in one "jump." It is then proposed to carry the canal over Blackstone Edge, the Pennines, and across the level plateau to a point south of Todmorden, where it would cut away east to the south of Bradford and Leeds, and the north of Huddersfield and Wakefield to join the Humber at Goole. The main features of the scheme are: To construct three huge canals across Britain, linking the Atlantic with the North Sea and large enough to allow the passage of liners; to electrify railways for heavy goods and to build tubes for coal transport alongside the canals. It is estimated that the scheme would cost nearly £500,000,000 and would take five to ten years to carry out.

### *Increase in Shipping at Hull Docks during August.*

The Hull Docks were busier during August than for some time past. Over 500 vessels (foreign and coastwise) were entered inward and about the same number outward. At the Victoria Dock alone 52 cargoes of timber were dealt with. The import wood season is at its busiest period and heavy arrivals from Sweden, Finland and other Baltic countries are now being supplemented by those from Russia, with the result that the docks devoted to this trade are the scenes of great activity. Some congestion has been inevitable in the circumstances, but the delay was considerably reduced by working throughout the holiday and by the extraordinarily fine weather which permitted discharging operations to be continued without interruption. One unfortunate happening was an extensive and disastrous fire at the Alexandra Dock among pitwood. The outbreak was out of control quite early, and efforts were concentrated on cutting it off from the adjoining yards and dock warehouses. Some thousands of standards of pit props were destroyed, and these mostly from Russia. Owing to the embargo on Russian products, the importation of Russian timber was delayed several weeks. Despite the intensive efforts to facilitate shipment before the close of navigation, the Soviet authorities have intimated their inability to forward the full quantity contracted for, and a reduced figure has been agreed upon. Imports of wood at the Hull Docks to the end of August were much in excess of those a year ago.

### *Port Improvements at Hamburg.*

Under the Government's public works programme for providing employment, it is announced that the State of Hamburg (River and Port Construction Department) is to be granted loans by the German Company for Public Works (Deutsche Gesellschaft für öffentliche Arbeiten) for port construction work which is to comprise the following:—

	Rm.
Renovation of State buildings in the Port of Hamburg ...	135,800
Painting and renovating bridges ... ..	67,000
Renovation of State buildings at Cuxhaven ... ..	66,200
Repairs to quay walls of the Kaiser Wilhelm basin—up to	1,920,000
Repairs to permanent way of port railway—up to ...	339,800
Work at Maarkenwarder basin—up to ... ..	403,000
Extension of the shrimpers' harbour at Cuxhaven—up to	121,400

The foregoing work provides for the advance from public funds of a sum up to Rm. 3,053,200.

## Notes from the North

### Wheat Handling at Liverpool.

**T**HERE has been a complete change in the method of handling wheat in Liverpool in the last few years. Prior to the war, 95 per cent. was landed on the dock quays, involving costs for master portage, cartage, etc. These processes have been superseded by the importation of the grain mainly in complete cargoes, which come alongside the grain elevators at Birkenhead. In the case of old mills not on the quayside, the grain is delivered overside into barges and conveyed direct to the mills, and by canal to Ellesmere Port. This change has reduced charges from approximately 5s. to a few pence per ton.

### Profitable Foreshore.

From the sales of gravel and sand from the beach, Fleetwood Corporation during the past year made a profit of £3,835, whilst profits from concrete products increased during the year from £144 to £2,409. Profits from the Fleetwood-Knott End ferry steamer service amounted to £715, compared with £851 the previous year.

### Seacombe Ferry Improvement.

It will be some months yet before the Seacombe ferry improvement scheme is complete. At the present time the roadway is being reconstructed and lowered at certain points from one to two feet. The levels of the new roadway were determined by four levels that could not be varied: (1) the main booking hall (the ferry turnstiles), Seacombe Ferry Hotel and Promenade; (2) the Birkenhead Road and floating roadway; (3) the highway outside Seacombe Station; (4) the roadway near Russell's Buildings. The levels of the new roadway have therefore been so arranged as to fit in with these four levels. The Ferries Department either had to "lift" the Seacombe Ferry approaches and the Seacombe Ferry Hotel or lower the highway to the levels established years and years ago, when the present improvements were not contemplated.

### £4,500,000 Spent on Tunnel Engineering Works.

Progress on the Mersey Tunnel workings is being fully maintained. The resident engineer (Mr. B. H. M. Hewett) reports:

Contract No. 3 (comprising the construction of the full-size tunnels on the Birkenhead side): (a) The contract amount is £749,075 3s. 1d.; (b) the estimated value of the work accomplished to date is £934,000 or 125 per cent. of the contract amount; (c) the fixing of the dado is continued, and about 7,900-ft. or 94 per cent. has been fixed; (d) the interior finish is complete; (e) cable laying is continued. The total number of men employed on this contract is about 300.

Contract No. 4 (comprising the construction of the full-sized tunnels on the Liverpool side): (a) The contract amount is £670,390 10s. 6d.; (b) the estimated value of the work accomplished to date is £705,000 or 105 per cent. of the contract amount; (c) the fixing of the dado is continued, and 8,000-ft. or 91 per cent. has been fixed; (d) the interior finish is complete; (e) laying of the cast iron roadway has commenced; (f) cable laying is continued; (g) the number of men employed on this contract is about 80.

Contract No. 4a (comprising the construction of the reinforced concrete roadway and other interior concrete in the circular cast iron lined tunnel under the river): (a) The contract amount is £384,884 0s. 9d.; (b) the estimated value of the work accomplished to date is £392,000 or 102 per cent. of the contract amount; (c) the fixing of the dado is continued, and 9,100-ft. or 88 per cent. has been fixed; (d) the interior finish is complete; (e) laying of the cast iron roadway has commenced; (f) cable laying is continued; (g) the number of men employed on this contract is about 80.

Contract No. 11 (Woodside Foundations): This work is making rapid progress. The state of the work is as follows: (a) The contract amount is £63,246 8s.; (b) the estimated value of the work accomplished to date is £13,000 or 21 per cent. of the contract amount; (c) the number of men employed on this contract is about 105.

Altogether on the foregoing contracts £2,078,000 has been spent, and 565 men are still employed.

In addition the following amounts have been spent in constructing the ventilation works: New Quay, £16,000; North John Street, £66,000; George's Dock, £62,000; Woodside, £45,000; Sidney Street, £36,000; Taylor Street, £16,000; total, £241,000.

Good progress has been made on contract No. 7, for telephones and fire alarms, held by the Automatic Electric Co. Contract No. 12, for carbon monoxide analysers, has now been let to the Cambridge Instrument Company, and manufacture has commenced. The total value of engineering works to date amounts to £4,577,350.

### Dock Board Debentures.

Mersey Docks and Harbour Board has completed the issue of £800,000 3½ per cent. debenture stock, created in March and June last. Mr. H. L. Roxburgh, chairman of the Finance Committee, at a recent meeting of the Board, commented that the issue which was offered to bondholders had been fully subscribed and allotment had been satisfactorily completed.

### Gladstone Dock, Liverpool.

Sixty-nine ships entered and 52 left Gladstone Dock, Liverpool, in a recent week, and the aggregate tonnage of the 121 vessels was 229,945 tons. According to a Mersey Dock Board official, whilst the increase is an encouraging sign that to some extent trade is reviving, a good deal of the tonnage is accounted for by the large number of cruising liners using the dock at this time of the year.

### Manchester Dry Dock Fire.

A serious fire in the Manchester Dry Docks, Trafford Park, was prevented by the prompt action of the night watchman. His attention was attracted by a smell of burning carried down by the wind from the far end of the dock, where three cargo vessels, including an oil tanker, the "Stuart Prince," were lying. On making investigations he found that the contents of a wooden rigging shed, consisting of ropes, tackle and canvas, were alight, and within a few minutes the shed was burning fiercely. The flames leapt high in the air and were visible for some distance. The "Stuart Prince" lay on the leeward side of the shed, and had the fire spread to some piles of loose timber that lay in the dock the vessel would have been in serious danger. The fire boat "Firefly" steamed to the dockside, but by the time she arrived the fire brigade had the outbreak under control.

### Ribble Navigation Incident.

Preston Navigation Committee's hopper No. 5 broke a cherished Southport tradition recently. It is a commonly held belief that anything which grounds on the Horse Bank never gets off. The hopper went out to try and salvage the Fleetwood trawler "Endymion," which was being towed to Preston to be broken up, when it broke away through the snapping of a hawser during a gale. A few days later the hopper, in her efforts, got a hawser across to the "Endymion," but owing to the rough weather there was again a break in the wire and the Preston boat was carried by the heavy swell on to the Bank. The hopper is a valuable craft in the work of dredging the Ribble, and preparations to tow the boats off, particularly the hopper, commenced when the Preston tugs "Perseverance" and "Lucas," belonging to the Navigation Committee, made a preliminary attempt. They were unsuccessful, but a channel was cut for the hopper enabling the tugs to achieve their object. Hopper No 5 was then brought round into the main channel, to be moored off the houseboat on West Beach, Lytham, in readiness for her journey to Preston. After a few hours on the slipway she was ready to be put in commission again. The operations were carried out under the supervision of Mr. Howarth, the Ribble chief engineer; Capt. W. J. Hearn, harbour master, and Mr. G. M. Vaughan, dredging superintendent.

### Liverpool and Manchester Traffic Returns.

It is good news to learn that the Liverpool port traffic returns show considerable improvement. For the four weeks ending August 26th the number of ships which arrived from all parts of the world was 240, with a total tonnage of approximately 763,000 tons, in comparison with 185 ships and a total tonnage of about 630,000 tons in the corresponding period of last year. There have been large increases in the imports to Liverpool of grain, fruit, tobacco and cotton of all kinds, particularly Egyptian and Sudanese. Although at the time of writing later figures are not available, a still greater increase in the number of arrivals at the port is expected. There are also indications that ships which have been lying idle are being brought into service again. The Liverpool steamer Neleus, 6,663 tons, which has been lying in Bidston Dock for several months is being reconditioned at Birkenhead and will be put on service from Liverpool to the East. Another vessel which has been lying in the same dock for about three months is also being recommissioned.

Manchester Ship Canal Company, in its approximate traffic return for the month of August, reports that there was an increase in revenue of £6,985, compared with the corresponding period of last year, the respective figures being £88,200 and £81,215. This is surely symptomatic of the trade improvement about which one has heard so much. The total capital receipts for the first eight months of 1933 amounted to £752,499, compared with £771,406 for the similar period of 1932, revealing a net decrease of £18,907.

*Notes from the North—continued***Groynes at Douglas, Isle of Man.**

Experimental groynes are to be built on the Douglas (I.O.M.) foreshore. The Corporation is making representations to the Lieutenant-Governor with a view to obtaining the co-operation of the Government in the consideration of the subject of the improvement of the foreshore, but in the meantime the Borough Surveyor will erect certain temporary groynes.

Councillor Teare, at the last meeting of the Town Council, suggested that observation should also be made of the "weep-holes" in the Promenade wall. He had been observing the action of those weep-holes, and every time the tide receded the water came through these holes and washed that part of the sand away, making the shore below the wall look like a quarry. Alderman R. Corlett replied it was absolutely necessary to have weep-holes, and plenty of them. They were a safety valve, and without them they would never keep the wall up. The Borough Surveyor considered that there was not one more than necessary.

**From Ferries to Tunnel.**

Birkenhead Corporation Ferries Manager has reported to his committee the receipt of a request from the engineer and manager to the Mersey Tunnel Joint Committee for the transfer of certain employees of the Ferries Department to the tunnel undertaking. The Ferries Committee express themselves as agreeable to the transfer, subject to the conditions of service being equivalent to those now operating and to the men being regarded as loaned to the Tunnel Joint Committee in order to protect their position under the Act.

**Birkenhead Fish Dock Idea Scotched.**

At the September meeting of the Birkenhead Chamber of Commerce, Mr. R. P. Fletcher reported that after several

months of discussion and of negotiation with the Mersey Docks and Harbour Board, it had been decided that the establishing of a wholesale fish market in Birkenhead at the present time would not only be inopportune, but outside the range of practical politics.

Mr. P. McGettrick suggested that the matter ought to be one for the railway companies to decide and not the Dock Board.

Mr. M. Pyke pointed out that there was a derelict portion of Birkenhead Docks served by three railways where the suggested market would be in an ideal position, while trawlers could enter during 20 hours out of 24.

Mr. Fletcher replied that the project was outside practical politics in view of the enormous capital expenditure which would be involved, and in view of the existing economic conditions.

**Manchester Ship Canal.**

Alderman J. H. Swales has been elected by the Manchester City Council to be a director of the Manchester Ship Canal Co., under Section 11 of the Manchester Ship Canal (Finance) Act, 1904, in the place of Alderman West, who has resigned his Corporation directorship on becoming chairman. The Manchester Corporation nominates eleven directors as against ten elected by the shareholders.

**Master Portage at Liverpool.**

Mersey Docks and Harbour Board have adopted a reduced master porters' rate in respect of Coir fibre and Coir yarn in dholls, ballots or bundles weighing under 14 lbs. each.

The rate was laid before the Ministry of Transport on September 8th, 1933, and will be deemed to be included in the schedule of charges at the expiration of one calendar month from that date, if no objections to the rate are made within the period mentioned.

## Hull and the East Coast

**Coal Exports from the Humber Ports show Increases.**

THE exports of coal from the Humber ports (Hull, Goole, Grimsby and Immingham) in August (four weeks) totalled 287,686 tons, against 246,289 tons in the corresponding period of 1932, thus reducing the decrease to date to about 57,000 tons. All, however, is not well with the Humber coal export trade. A considerable expansion of business is expected to result from the new trade agreements entered into abroad, but owing to the restriction of production under the Coal Mines Act, exporters have been unable to obtain the necessary supplies and business has gone elsewhere. As the outcome of considerable pressure the quota of production for September in the Yorkshire and Midland area has been increased from 55 to 59 per cent., and in addition a special allocation of 110,000 tons has been authorised to meet current export requirements. A revision of the Coal Mines Act is now in contemplation in the direction of ensuring adequate supplies and reasonable prices, without which it is feared the Humber ports must continue to suffer and their excellent coal shipping facilities remain mainly idle.

**Restrictions in Weight of Vehicles using Hull Docks' Bridges.**

The restrictions on the weight of vehicles using the bridges at the Hull Docks imposed by the London and North-Eastern Railway are still under the consideration of the Hull Chamber of Commerce and Shipping, who have sought to enlist the aid of the Hull Corporation in the matter. From an engineer's point of view it is stated the restrictions in certain cases are justified, but those whose business takes them over the bridges feel that they are hardly dealt by in having the heavy lorries now in use prohibited to a very considerable extent.

**Annual Meeting of the Scarborough Harbour Commissioners.**

The report of the Piers and Harbour Committee adopted at the annual meeting of the Scarborough Harbour Commissioners showed receipts for the year ended March 31st to be £6,291, as compared with £6,103 in the previous period and £6,870 for 1931. In the past year lighthouse admission fees and expenditure were for the first time kept separate from the general revenue account. The income from this source was £322 and is included in the total revenue given above. After allowing for expenditure there was last year a surplus of £2,141 on general revenue and £124 on lighthouse account—together £2,265, as against £1,310 a year ago. These totals are arrived

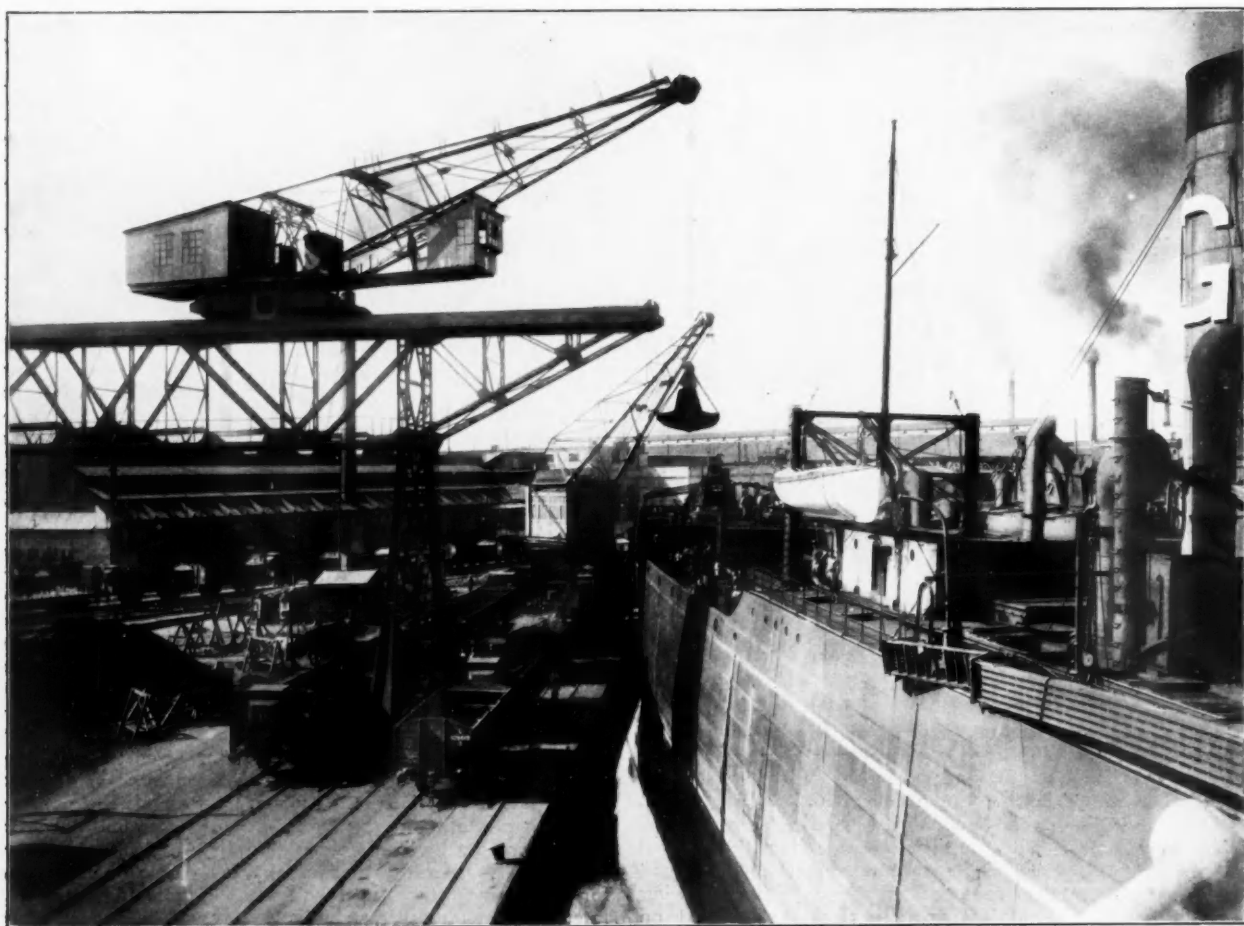
at before charging interest on money borrowed from the Scarborough Corporation and, as indicated by the accounts, the surplus is not sufficient by an amount of £252 to cover the interest due. The improved balance is attributed to a reduction in expenditure mainly in maintenance, wages and salaries, and a considerable increase in lighthouse admission fees. With regard to the last named the amount £322 represents the first full year's takings since the restoration of the lighthouse, and compares with £122 for 1913, the highest pre-war total. The rest of the income, the report states, is maintained at a steady level. One result of a naval visit in 1932 was an increase in dues from pleasure steamers using the harbour. The committee expressed regret at losing the services of Mr. John Watson Rowntree through resignation. Mr. Rowntree had served on the Board 27 years. During the year the personnel of the staff had considerably altered through the retirement of Commander R. Constable, R.N. (Harbour Master), after four years' service; Mr. F. D. Taylor (collector of dues), 13 years' service; the late Mr. Douglas (Works Department), 20 years; and Mr. Robinson (pier man), 28 years; and at the end of August, Mr. A. Clark (deputy harbour master), 25 years. It is intimated that Capt. R. E. Andrews, D.S.C., has been appointed Harbour Master and Mr. F. H. Whitehead pier superintendent and collector of dues; and that a new deputy harbour master will shortly be appointed.

At the annual meeting Councillor Jackson presided and, referring to the financial position of the Commissioners, said that he would like to feel, seeing that they owed £55,000, that they did not come there year after year without taking notice of the fact, and he indicated the possibility of floating a loan at a lower rate of interest in order to redeem their indebtedness to the Scarborough Corporation and reduce their loan charges and interest, which now stood at £4,599 annually. On the present income it was impossible to pay this sum, and he suggested that it should be one of the first duties of the new chairman of the Finance Committee and the Commissioners to bring forward a scheme to show there was a way out. He hoped that within six months every penny they owed to the Corporation would have been repaid. Councillor Preston said that they had applied to the Corporation Finance Committee for a reduction in the rate of interest, but that committee had not acceded to their request. The Corporation had had a golden opportunity to have secured themselves for all time on the harbour, for if at some future time the Commissioners failed to pay the interest, the harbour would have become the property of the town. Councillor Jackson was re-elected chairman and Capt. W. Aiston deputy chairman.

## *The Port of Savona*



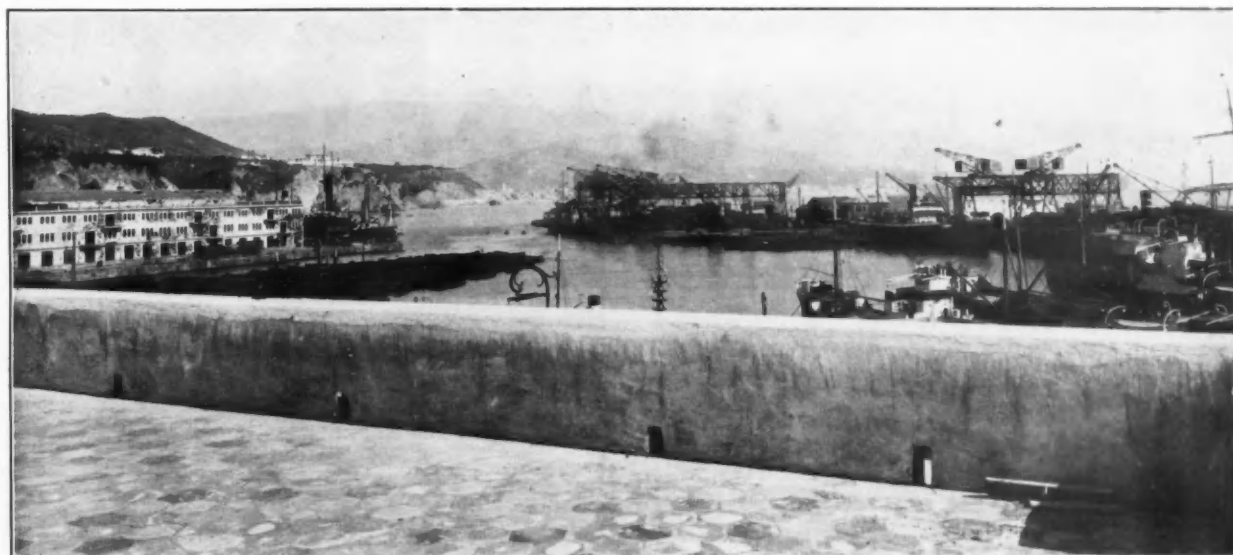
*Victor Emanuel Drydock.*



*Electric Crane and Ilva Iron Works Quay*

## The Port of Savona and its Growing Importance

By ANTONIO GIORDANO



*Général View of the Port of Savona.*

THE Port of Savona has at present the form of a long bay running between the coast and the jetties of the moles placed practically parallel to the coast itself. The geographical position of Savona is  $44^{\circ} 18' 46''$  latitude North and  $8^{\circ} 29' 15''$  of longitude East. The Port of Savona, situated about 20 miles by sea west of Genoa, is of importance in connection with Italian coal imports, this trade totalling about 1,500,000 tons annually.

Savona is the natural port of transit for the industrial province of Piedmont. Just outside the port there are very large iron works, and a few miles down the coast at Vado Ligure there are important oil depôts and coke works. There is also a flourishing shipbreaking industry, but coal imports constitute the principal trade of the port.

The water area of the outer part of the Port of Savona is 108,500 square metres, while the water area of the inner docks is 222,000 square metres. The entrance to the port is 162 metres wide, to the Victor Emanuel Docks 70 metres wide, and to the so-called "Darsena Vecchia" 40 metres wide. The depth of the water varies from a minimum of 7 metres to a maximum of 10 metres. The port is sheltered by four artificial breakwaters, known as (1) Molo San Erasmo, (2) Molo delle Casse, (3) Molo Nuovo, (4) Diga di Tramontana. The length of quayage in the Port of Savona at the present time is 2,715 metres, but all this quayage is not utilisable for commercial operations.

In 1871 Parliament allowed a credit of 2,000,000 lire for the erection of a maritime station, for the purpose of connecting the quays of the Port of Savona to the Savona-Letimbro Railway Station. Three years afterwards Savona was connected directly to Turin by railway. By the law of July 16th, 1884, the Italian Government included Savona among the first class Italian ports, and by the law of July 14th, 1889, a credit of 1,800,000 lire was allowed to build a new mole to increase the capacity of the port. In 1907 a further credit of 7,000,000 lire was allowed.



*Old Port at present used by sailing ships and vessels laid up.*

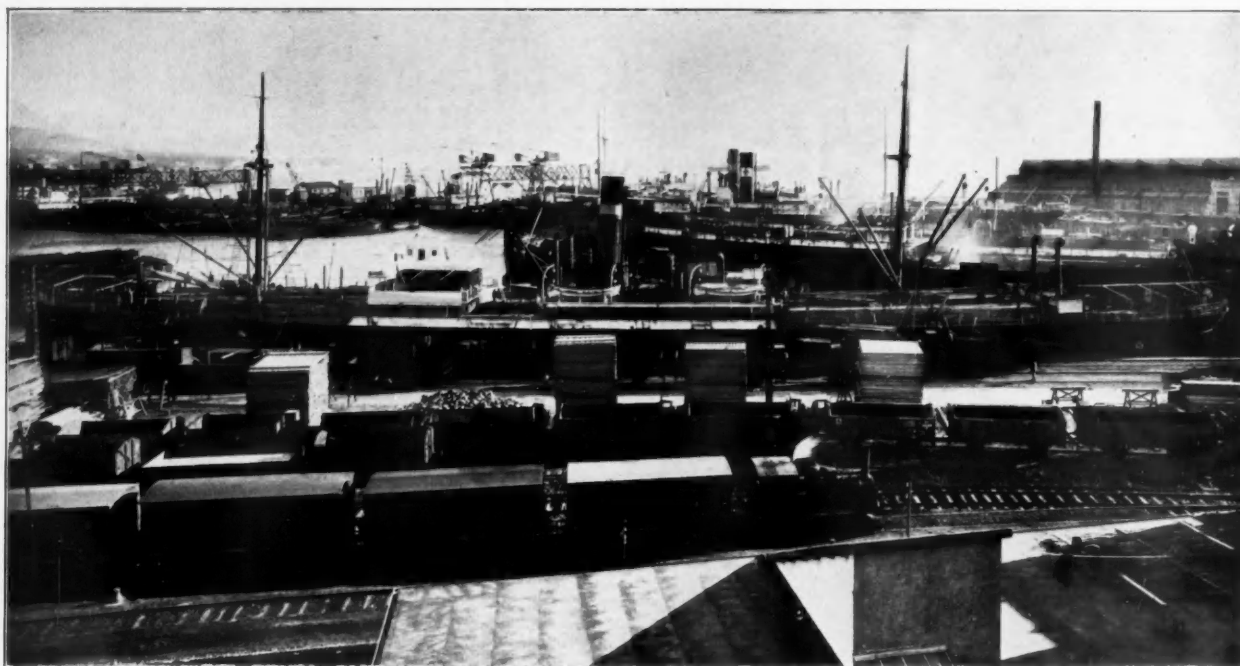
On October 27th, 1918, the Ente Portuale Savona-Torino was created for the purpose of making the necessary harbour enlargements and also operating the port. During the first year of its existence the Ente Portuale Savona-Torino undertook important improvements, amongst which were the construction of 12 electric cranes to the value of 1,584,000 lire, the construction of a concrete warehouse for the storage of cotton to the value of 1,875,000 lire, and the construction of a shed to the value of 175,000 lire.

In 1923 the Ente Portuale ceased its activity, but this fact has not prevented further improvements being carried out. These improvements consisted of the enlargement of the coal unloading plant of the Società Funivie Savona-San Giuseppe and the construction of new breakwaters to protect the inner harbour, for which a credit of about 20,000,000 lire has just been allowed.

Before going into the question of the enlargements carried out in the coal unloading plant, it may be interesting to describe it fully. The plant consists of two parts: the discharging plant situated at the entrance to the Port of Savona, and the receiving plant at San Giuseppe, a distance of 18 kilometres, which is reached by means of an aerial ropeway. The first part consists of a concrete quay with four very powerful grabs, which take the coal from the holds of the vessels and deposits it into bins on the quay. From these bins small tubs, which travel on the aerial ropeway to the receiving plant, are filled and weighed automatically. At the receiving plant at San Giuseppe the travelling tubs can be loaded directly into railway cars, put into other bins for storage or on the deposit ground. The tubs travel on the aerial line, one every 23 seconds, at a distance of 72 metres one from the other. The aerial line is suspended on lattice work trestles at various heights up to 115-ft., and passes over valleys exceeding 1,560-ft. in width and 585-ft. in depth, reaching a height of 4,100-ft. above sea level, descending to the plain of San Giuseppe at 1,160-ft. above sea level.

San Giuseppe, distant 18 kilometres (in a direct line) from Savona, stands on the main line Savona-Turin, and there is also a railway junction for the line Alexandria-Milan, which also permits the transporting of coal from Savona and San Giuseppe to Lombardy. On account of the facilities offered by the Funivie, coal can be competitively sent to Lombardy, notwithstanding that Genoa is the natural port of transit for this latter province.

It is notable that most of the ports of North Italy lack ample quay space and that railway access is difficult because these ports are all hemmed in by the Maritime Alps. In consequence of this, storage ground in the port is limited, and transport rendered difficult and costly. These difficulties are overcome at Savona by the Funivie. It is of maximum importance to coal importers not to consider, as at one time, that steamers are floating depôts, limiting the discharge to 5/600 tons per day, because to-day it is in their interest to discharge vessels with the greatest possible speed, thereby diminishing the costs of handling. This might not always be possible for lack of immediate forwarding orders, but through the large capacity

*The Port of Savona and its Growing Importance—continued**General View of the Victor Emanuel Drydock.*

of the Funivie Plant the cargo can, without extra cost, be discharged, received and deposited at San Giuseppe at 3,000 tons daily or more and distributed from there at any rate required. The plant at the Port of Savona is capable of discharging up to 7,000 tons in 24 hours and, being connected by the aerial ropeway, has at its disposal the enormous deposit ground of San Giuseppe, capable of storing hundreds of thousands of tons.

At the private wharf of the Funivie there is a depth of water of 30-ft., which admits the berthing of steamers of any size. The four electric cranes on this wharf are of the travelling type, and can therefore unload from any position required. The grabs unload the coal from vessels alongside and, as well as automatically loading it on to the travelling tubs for forwarding to San Giuseppe, can, to suit requirements, weigh and load the coal into lighters or, in case of necessity, put it into another special deposit on shore at the Port of Savona.

The capacity of each crane is 150 tons per hour, giving, therefore, a maximum capacity for the four cranes of 600 tons per hour, but taking into account the necessity of gathering coal in the hold, especially towards the end of discharging, the capacity can be averaged at 350 tons per hour, and the transport capacity of the aerial ropeway is 3,000 tons per day. The deposit ground at San Giuseppe is in front of the railway station there and comprises an area of 300,000 square metres, containing large sidings for the accommodation and movement of railway wagons and formation of trains, etc. The tubs, which arrive at a height of 16 metres from the ground at the receiving dépôt, run on a series of rails over 48 cells from which the coal can be automatically loaded direct into railway wagons. Under these cells a wagon of 20 tons can be loaded in 30 seconds; mechanical traction is used for the movement of the wagons under the cells and drawing the wagons out. A train of 30 wagons, roughly 600 tons, has been loaded, shunted and despatched to the railway junction in half an hour. The extent of these railway sidings is over 100 kilometres, and therefore ensures continuity of working.

If the coal has for any reason to be deposited, the tubs are diverted over movable bridges, which can distribute the coal over the deposit ground for a distance of 900 metres in length

and over 30 metres in width. The plant at San Giuseppe is also furnished with travelling electric cranes with grabs for re-loading from deposit, these cranes having a working capacity of about 150 tons per hour. All the plant is electrical, and the deposit ground served by two travelling bridges has a superficial area of 52,000 square metres. There are also various other mechanical means for the manipulation of coal, such as screening, classification as regard to size, and general working of anthracite or coke. This special plant is capable of handling up to 300 tons of various qualities of coal per day. The question of handling coal is one that has constantly exercised the minds of both exporters and importers, and with the plant of the Funivie damage to coal is avoided. Taken direct from the holds and filled into bins, which are constantly kept practically full, there is no drop to cause breakage, and from the bins it automatically goes on to the travelling tubs containing just one ton. The tubs are filled by gravitation with no drop at all, and the same care is exercised at the receiving dépôt at San Giuseppe.

In consequence of the increasing volume of coal imports into the Port of Savona, the Società Esercizio Imprese Portuali has been created to undertake the enlargement of the above plant, which has been built by the Società Nazionale delle Officine di Savigliano.

The enlargement of the plant includes amongst other things the installation of a concrete quay mounted on pillars specially built in deep water to allow steamers to unload directly at this quay. Actually the Port of Savona consists of the following parts: (1) Outer harbour, (2) old dock, (3) Victor Emanuel Dock. The outer harbour is formed by the water surface existing between the breakwater sheltering the port, which is used for the oil trade, and the coast and the Paolo Boselli Pier, where the depth of water reaches 16 metres. On the Boselli Quay are fitted four 6-ton cranes and two electric coal elevators. In front of the Boselli Pier, on the coast, there is the Savona-San Giuseppe aerial ropeway terminal with the new concrete pier for the unloading of coal. The old dock is only used at present by tonnage laid up or by sailing vessels. The most important part of the Port of Savona is represented by the Victor Emanuel Dock, situated further west of the Boselli Pier, and including four quays on which there are six electric cranes and two electric coal elevators.

In connection with the existing storage facilities it may be mentioned that there is only one double-storey warehouse, having an area of 10,000 square metres.

Regarding shipping at the Port of Savona, the following figures show the imports and exports for the years 1927-1932:—

		Total Imports Tons	Total Coal Imports Tons	Coal Imports by the Funivie Tons	Total Exports Tons
1927	...	1,290,000	1,209,496	545,979	60,000
1928	...	1,456,000	1,180,035	535,419	86,000
1929	...	1,791,000	1,749,577	746,810	98,000
1930	...	1,687,000	1,384,988	666,668	109,000
1931	...	1,491,000	1,234,828	644,499	157,000
1932	...	1,501,000	1,130,227	—	—

Traffic in the Port of Savona has increased considerably in the course of the last few years, particularly as far as exports are concerned, and this fact is due particularly to the increase in the callings at Savona of regular steamship services.

*General view of the Coal Unloading Plant.*

# PORT OF SA

Scale of Metres.

METRES 100 200 300 METRES

1 Metre = 3.28 Feet

Garbasso Point

FRANCIS PLOTTI BREAKWATER

PAOLO BOSELLI JETTY



NOTE:- Soundings are in Metres below Mean Low Water

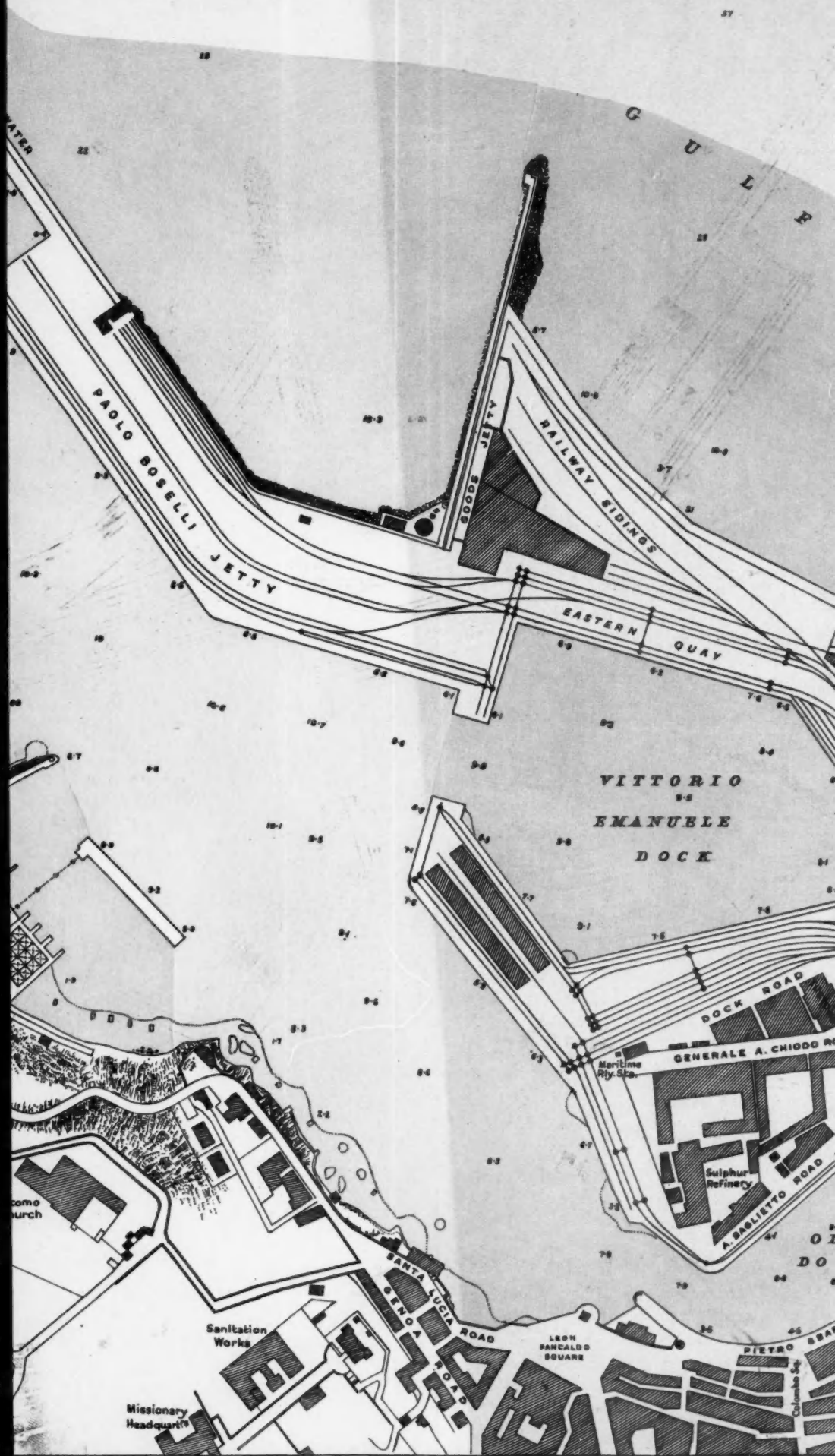
GENOA ROAD

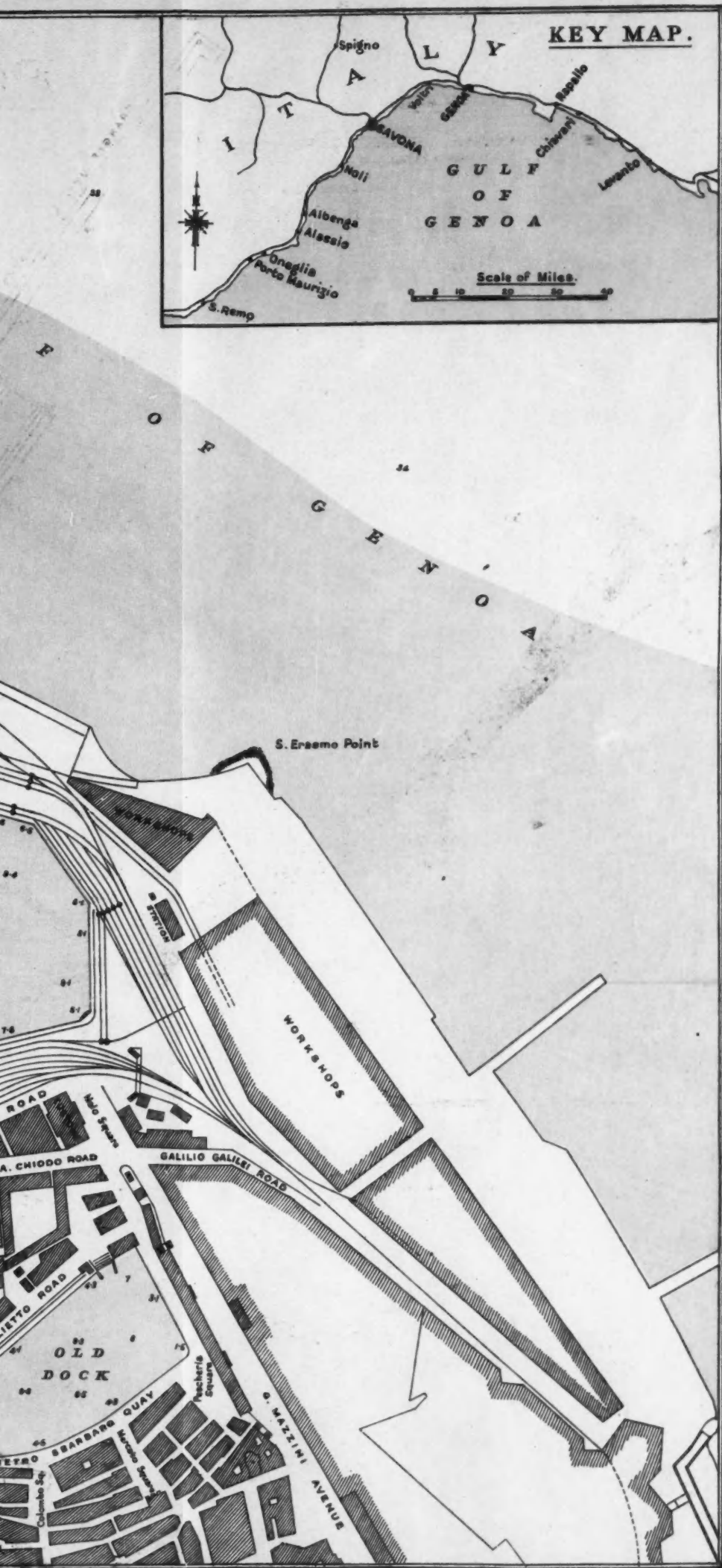
S. Giacomo Church

Sanitation Works

Missionary Headquarters

# PORT OF SAVONA.

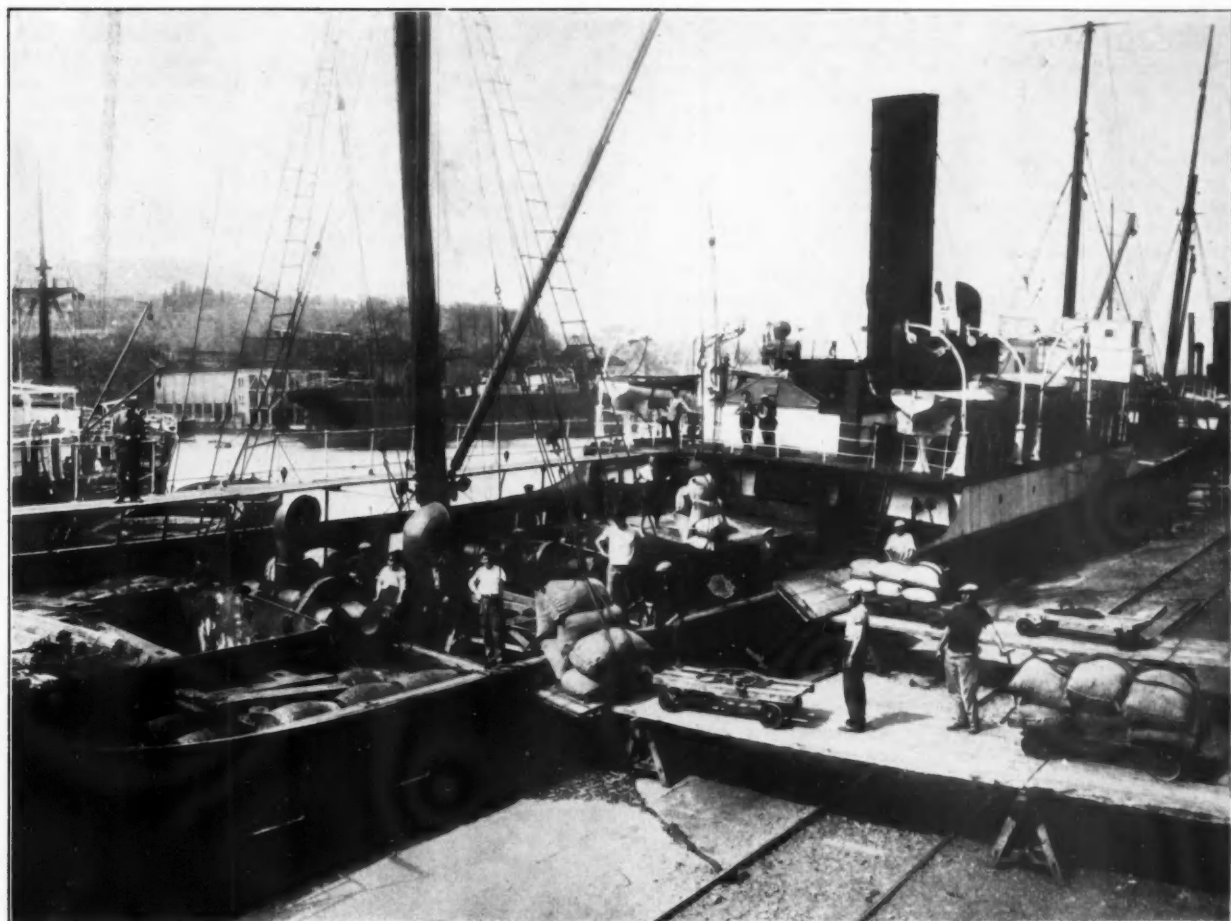




# ПОСТРОИ



## *The Port of Savona*



*Unloading Grain.*



*Interior of General Cargo Warehouse.*

## Scottish Harbour Notes

### New Pier at West Loch Tarbert.

IT is generally conceded that one of the best piers on the west coast of Scotland is the newly constructed pier at West Loch Tarbert. The old stone pier (in addition to being raised three or four feet to the road level) had been considerably extended with steel beams and framework, but it had become quite inadequate to cope with the ever-increasing passenger and car traffic to and from the Island of Islay. Occasionally, in the winter months, the mail steamers were prevented from embarking and disembarking owing to the old pier being under water, but this will now be obviated. The reconstruction scheme was carried out to the order of Messrs. McBrayne, Ltd., by the Lambhill Iron Foundry Company.

### Inverness Harbour Trustees.

It was stated at a recent meeting of Inverness Harbour Trustees that the Board of Trade had expressed surprise that the Trustees had carried out an alteration in connection with the £25,000 extension scheme without having received the Board's consent in advance. It was explained at the meeting that the Trustees, while the scheme was in course of construction, had decided to make a close quay instead of an open one at the north end of the harbour. The Board of Trade thought they should have seen the alterations first, while the Trustees' engineer held that they had power to deviate under the scheme. The Board, however, in their letter added that only after some hesitation had they decided not to withhold consent.

### Grangemouth Dockyard.

Since near the end of July, when the inner gates of the Carron Dry Dock at Grangemouth were removed to the north and south quay walls, the employees of the Grangemouth Dockyard Co., Ltd., have been busily engaged in carrying through their complete overhaul. The gate at the south side has now been fitted into position, thus completing a very successful and somewhat difficult piece of workmanship. The gates each weighed 60 tons and have been constructed of greenheart and yellow pine timber, and finally coated with tar for preservation. The riggers and carpenters engaged in the work have shown commendable aptitude in the matter of hewing and fixing these hard woods and of boring holes 9-ft. long for the huge bolts necessary for keeping the timber in position. The steamer "Dunclutha" was also utilised in the transfer of the gates to their accustomed place of the past fifty years.

### Aberdeen Harbour Board receives Royal Assent to Provisional Order.

A special committee of Aberdeen Harbour Board appointed to promote the Provisional Order to amend the Aberdeen Harbour Acts, 1895 to 1932, relating to rates and for other purposes reports that the Order received the Royal Assent and becomes operative on and after October. The rates in the schedules (the committee states) have been fixed on a reasonable basis, and on as low a scale as possible to ensure the necessary revenue for harbour purposes. In these circumstances the committee suggest that the Board should not alter the rates, as at present framed, for a reasonable period of years. One factor which had seriously impressed the committee was the high proportion of revenue required to meet interest and sinking fund on the debt of the undertaking, which had risen from 28 per cent. in 1900 to 41 per cent. in 1932. Since 1900 the capital works undertaken by the Commissioners on improving the harbour has cost (less receipts) the sum of £1,113,761, and during the same period the debt of the undertaking has risen from £392,292 to £856,665. The committee therefore recommended for the consideration of the Board that during the next few years no capital works excepting necessary replacements, etc., should be undertaken, so as to allow of the whole of the statutory contribution to the sinking fund being applied to the reduction of the present debt.

### Meeting of Dundee Harbour Trustees.

At a recently held meeting of Dundee Harbour Trustees it was reported that the alterations in the scale of local harbour charges were now in force and that an endeavour was now being made to encourage vessels coming from abroad with part cargoes to continue their voyage to Dundee. Dealing with this matter, the Finance Convener (Mr. Ralph Cowper) said that, while they had calculated the likely result to their revenue, it was still problematical whether the result would be to the ultimate advantage of the port. They had, however, given the shipowners their chance, and it was up to them to prove the concession was justified. They had sunk a lot of money in deepening water berths and commodious sheds. Those all involved heavy upkeep expenses. If, therefore, they did not get the same revenue, they might have to consider the conces-

sions granted. A surplus of £22,122 was reported in a survey of harbour finances during the past year, as compared with £8,270 the previous year, but it was explained that this improved increase is not entirely due to increased revenue, the position being that earnings were up £8,224 and expenditure was down £5,629. Tonnage and export dues had improved, but import dues were below the previous year's standard.

### Repairs to Victoria Harbour, Dunbar.

Work in connection with the repair of a portion of the Victoria Harbour at Dunbar is now in progress under the direction of the contractors, Messrs. William Binnie and Sons, of Glasgow. Workmen have recently been engaged taking down the masonry forming the quay wall with the object of getting to the foundations. The work is being expeditiously proceeded with, and operations have continued over eighteen out of the twenty-four hours in order to permit their taking advantage of the spring tides for its re-erection. Additional men from the local Labour Exchange are employed, and it is hoped to be able to have the foundations in for the new wall with these tides. A coffer dam will probably be built around the works, and everything possible is being done to have the scheme completed before the winter sets in.

### New Groyne at Eyemouth Harbour.

With the object of averting the accumulation of sand at the entrance to Eyemouth Harbour a groyne has been laid down on the foreshore at a cost of over £500. For years the fishing fleet have been much hampered in entering and leaving the harbour owing to a sand bank, and, despite frequent dredging operations during recent years, no improvement has resulted. It is fully anticipated, however, that the construction of the groyne will ultimately have the desired effect of drawing the sand away from the harbour mouth.

## The Port of Amsterdam

The position of the Port of Amsterdam can be seen from the following figures in regard to number of vessels and tonnage and to the goods traffic arrived and sailed, as compared with the corresponding figures of last year.

### SEAGOING VESSELS AND TONNAGE.

		ARRIVALS				SAILINGS			
		No.	Per Cent.	N.R.T.	Per Cent.	No.	Per Cent.	N.R.T.	Per Cent.
August	1932	270		377,761		271		393,164	
"	1933	273		394,782		281		389,180	
		+3	+1.11	+17,021	+4.51	+10	+3.69	-3,984	-1.01
July	1933	289		390,350		302		429,860	
August	1933	273		394,782		281		389,180	
		-16	-5.54	+4,432	+1.13	-21	-6.95	-40,680	-9.46
Jan.-Aug.	1932	2,216		3,216,551		2,215		3,227,969	
"	1933	2,151		3,038,822		2,171		3,102,650	
		-65	-2.93	-177,729	-5.53	-44	-1.99	-125,319	-3.88

### SEAGOING GOODS TRAFFIC (In Tons of 1000 Kilos\*).

			1	2	3	4	5
			Import	Transit incl. in col. 1	Export	Transit incl. in col. 3	Total col. 1 & 3
July	1932	...	250,761	43,489	129,084	32,031	379,845
"	1933	...	313,407	52,857	138,094	46,243	451,501
			+62,646	+9,368	+9,010	+14,212	+71,656
			+24.98%	+21.54%	+6.98%	+44.37%	+18.86%
June	1933	...	222,303	58,734	110,233	53,693	332,536
July	1933	...	313,407	52,857	138,094	46,243	451,501
			+91,104	-5,877	+27,861	-7,450	+118,965
			+40.98%	-10.00%	+25.77%	-13.87%	+35.77%
Jan./July	1932	...	2,027,736	355,986	888,426	233,478	2,916,162
"	1933	...	1,939,462	396,214	880,899	324,420	2,820,361
			-88,274	+40,228	-7,527	+90,942	-95,801
			-4.35%	+11.30%	-0.84%	+39.95%	-3.28%

\*These figures have been taken from the monthly statistics of the Central Bureau, The Hague, Holland.

Classified according to flag the number of vessels which entered the Port of Amsterdam during August was:—Dutch 136, British 48, German 32, Swedish 18, Norwegian 18, Danish 4, American 1, French 1, Greek 2, Lettish 2, Finnish 5, Polish 1, Belgian 1, Dantzic 1, Yugoslavian 2, Russian 1.

Vessels laid up at Amsterdam:—August 1st, 1933, 30 vessels measuring 131,397 tons gross; September 1st, 1932, 63 vessels measuring 329,189 tons gross; September 1st, 1933, 33 vessels measuring 141,380 tons gross.

## Modern Dock Facilities\*

### Some Comparisons of British and Continental Facilities

By A. H. ROBERTS, O.B.E., Member of Council

THE employment of the term "modern" limits the consideration of this subject to the more recent developments in dock facilities. Civilisation has been described as "the multiplication of wants." Just as invention waits upon necessity, so development follows upon demand, and, in these days, the produce of almost every country is in demand in some other country.

Transport is not an end in itself; it is a means to an end. Its cost must be reduced to the lowest possible figure, since it constitutes an important item in the ultimate price of an article to the consumer, whether it be foodstuffs, or materials for domestic, commercial or industrial use. To meet this requirement new methods have been devised for handling goods as they pass through the various channels to their ultimate destination. The specific factors which have governed the development of facilities may be analysed as follows: (1) a demand for an increase in the size of vessels; (2) a demand for a general speeding up of all operations, especially for the rapid turn round and release of ships in port; (3) a demand for economy of labour in handling, and a desire to improve the conditions of the workmen; (4) a demand for greater lifting power; and (5) a tendency to carry goods in bulk. All the developments suggested by these demands must be regulated strictly by an economical use of capital. The demands are somewhat inter-dependent, but a short analysis of each will make clear the main lines along which development has proceeded:—

1. Demand for Increased Size of Vessels.—The highway of the seas being of vast dimensions and free of tolls, the most economical means of transport thereon is found in the carriage of great quantities of goods in large vessels. The larger the bulk moved at any point, the greater is the economy of cost and it very rarely happens that the total cost of transport is exactly proportional to the quantity carried. Again, economy in the bulk discharge of materials depends on the magnitude of the volume to be dealt with.

For these reasons, together with the need for additional speed and greater passenger comfort, larger vessels are being built, resulting in improved economy per ton of material transported. This tendency towards larger vessels has necessitated heavy capital expenditure by port authorities in the provision or alteration of wet and dry docks, protective works and dock entrances, and in the deepening of channels and berths by dredging. Such works are very costly, and an economic limit obtains at a port at which it becomes better to refuse to provide for the few large ships. This is more particularly the case where deep water quays cannot be adopted owing to the tidal range being too great for convenient working.

2. Demand for General Speeding up of all Operations, especially for the Rapid Turn-round and Release of Ships.—The movement of a large bulk slowly as in a ship, or smaller bulks more rapidly as on rail, provides a measure of the flow of traffic and demands great expedition when bulk is broken (or made up) at the quayside, if there is to be any approach to the average flow of traffic. The high cost of the building, running and upkeep of ships makes it imperative that vessels should discharge their cargoes rapidly and start out upon fresh voyages as soon as possible, economy of sea transport depending largely upon the number of voyages which a vessel can make in, say, a period of twelve months. This is perhaps the most compelling of the factors creating a demand for expedition in the discharge and loading of vessels; economy (in the narrow sense of mere cheapness at the moment) is of secondary importance to expedition in respect of the rapid turn-round of a vessel and its release.

Another factor is the shorter working day. A vessel engaged in carrying cargo steams for 24 hours of each day; but the loading and discharging operations in port are often restricted (except under special and expensive overtime arrangements) to about a third part of each day. Movement of goods by rail is possible during more than eight hours per day. These, and other less important factors, call for the most intensive system possible in the loading and discharge of cargoes at the quayside. To the vessel, a day saved in port means an extra day's carrying; to the dock-owner it means an additional day of usefulness of the berth. This is a definite contribution towards

increasing the number of vessels handled, and is of value alike to dock-owner, stevedore and quay worker.

The demand for speed—or more tons per hour—involves mechanical work. This calls for big structures (of high capital cost), mobility and working parts capable of dealing with large individual units of load. These again demand power supply and mains. All must be regulated by the necessity for an economic return—direct or indirect—upon the cost. Interest upon, and amortisation of the expenditure have to be provided for by the revenue obtained, and this depends upon the quantity handled.

3. A Demand for Economy of Labour in Handling and a Desire to Improve the Condition of the Worker.—Regarded merely as a machine, man is expensive and inefficient; he is far more useful in giving his trained skill in the control of the machines which he has devised. To-day workers are treated more as human beings, and they cannot be employed economically for the mere mechanical operations of lifting and carrying loads, which can be undertaken by suitable machinery.

The actual transport of goods from the place of manufacture to the point of consumption is essentially unremunerative and should, therefore, in the interest of economy of cost to the consumer, be performed as quickly and efficiently as possible.

In this country, conditions of service, rates of pay and hours of work are more favourable to the worker than is the case in most foreign ports, and this fact constitutes a further handicap for British trade.

4. Demand for Greater Lifting Power.—It is more economical to make one heavy lift than several small ones, and the modern tendency is to collect a number of items together and handle them as one unit. The latest development of this principle is the use of containers, now widely adopted by biscuit manufacturers, furniture removers and others. The universal desire for improved output per unit of cost has led to a great increase in the size of all manufacturing and generating plant; and, as much of such plant manufactured in Britain is exported, the need arises at all ports for efficient means for handling such cargoes. These tendencies have chiefly been responsible for the evolution of the modern quayside crane.

5. The Demand for Carrying Goods in Bulk.—Here, as before, economy in carriage and in handling is the decisive factor. Certain goods—such as oil, grain, coal and ore—lend themselves very readily to conveyance in bulk in ships, and this method of transport is necessarily economical owing to the absence of packing material, its manipulation and cost, and to the avoidance of interstices between bags, cases or containers, thus utilising for the goods themselves nearly 100 per cent. of the carrying capacity of the hold. The bulk method of conveyance should be adopted wherever possible and continued forward to, or as far as possible towards, destination by the employment of barges, bulk vans, tank wagons, etc., of the largest practicable capacity. Economy in the ship (i.e., bulk transport) would be outweighed by labour in bagging or casking and separate handling, unless special machinery were provided. This has been done, therefore, in almost all ports.

#### Special Equipment.

Having briefly summarised the character of the changes which have taken place, the fact has now to be considered that the ports of a country are the gateways through which its sea-borne trade has to pass. Its imports must be received in large cargoes and quickly distributed to destination in smaller units. Its exports must be loaded economically and expeditiously for shipment outwards. Goods to be sea-borne coastwise must be handled conveniently, if possible at berths in a sheltered harbour or tide-way, to which vessels have access without regard to tidal restriction.

Since ports are only gateways and not destination, they must be provided with every facility for free movement of rail, road or canal traffic and, in addition, with a considerable measure of quay space for the temporary laying down of goods. This latter requirement is due to the fact that every vessel is, or should be, able to load or discharge at a speed greater at the moment than that at which its cargo can be brought forward or removed.

Before passing on to discuss and compare British with Continental dock facilities, I shall consider briefly some of those which are at present in constant use at ports in the United Kingdom.

Oil.—As regards oil, Britain is an importing country. For this purpose the general modern practice is to provide wharves or jetties specially for oil and to erect tanks near to the jetty

\* Paper read before the Leeds and District Section of the Institute of Transport at Hull, on March 21st, 1933, and published by kind permission of the Institute of Transport.

### Modern Dock Facilities—continued

for the storage of the oil. Pipe lines from the face of the jetty are laid shoreward to the tanks and the oil is pumped through them, usually by the ship's pumps.

It is usual to choose an isolated spot for the depot and to surround each tank with a walled or embanked moat capable of holding the whole contents of the tank, in order, in the event of a fire, to prevent burning oil from spreading. The precautions adopted are such that fires are of a rare occurrence. From the storage tank, oil is drawn off as required into tank wagons or tank motor lorries for general distribution. The tanks, pipes, valves, etc., are not of a very costly nature, and as the pumping is usually done by the ship's pumps the unit cost of handling is low.

Oil depots of this character are provided at many ports in Great Britain. e.g., Bristol, the Humber, the Mersey, etc. Thicker fluids, such as molasses, tar and asphalt, can be handled in a similar manner but to a more limited degree.

Grain, etc.—Grain of various kinds, though not a liquid, lends itself very well to bulk handling. Unlike oil, it cannot be pumped, but it can be handled very efficiently and expeditiously by mechanical or pneumatic elevator plants.

A bucket elevator consists of an endless band or chain of buckets which can be lowered into the vessel's hold and thence can elevate the grain to a suitable height from which it flows by gravity on to conveyor belts ashore. As each bucket completely fills itself in the bulk grain, the bucket elevator has a high efficiency. But the bucket elevator cannot clean up a ship's hold; and it is necessary to employ men to trim the grain to the elevator as soon as the buckets reach the floor of the hold or the separating mat at the base of each parcel. Where there are several parcels in one hold the trimming costs in labour mount up rapidly and greatly reduce the efficiency of the elevator plant over the whole cargo.

These conditions have led to the introduction of the pneumatic grain discharging plant. The pneumatic method may roughly be described as a pump producing a stream of air of high velocity in which the grain to be transported is floating and with which it is carried through the pipe system. The pneumatic pipes are provided with suitable nozzles which are worked down into the mass of grain and can be held to the grain almost to the end of the discharge, thus obviating the necessity of trimming. The pneumatic system also has the advantage of drawing away the dust and leaving a clear atmosphere in the hold for the men who have to work there.

Under either system the grain can be weighed immediately on arrival ashore. The ship's discharging machines may be attached to a fixed tower on the quay, or may be housed in a travelling structure on the quay, or they may be provided entirely in a floating craft which can be moored alongside the vessel. In the latter case discharge may be either to quay or overside into barges, but this method requires ample water space. At Bristol, both these operations take place simultaneously by means of two floating crafts.

From the ship's side the grain is carried by belt conveyors either in tunnels or overhead to a storage warehouse at a convenient point behind the quay where it may lie until required by the merchant. Economy of quay space demands that large bulks of grain shall be stored in high silo warehouses, rather than be spread out in dock sheds.

To justify the provision of costly floating grain discharging plant there must be sufficient demand for lighter or barge transport; such ports as Liverpool, Hull, Avonmouth and London meet this requirement in some degree, but they cannot compare with Rotterdam or Hamburg in respect of the intensity of the transhipment through traffic to the waterways of Germany.

While grain is the commodity usually handled by elevator and conveyor, other materials are not infrequently dealt with by the same means.

Package Cargoes.—Goods in bulk, such as oil and grain, lend themselves to mechanical handling, but where the cargo consists entirely of separate packages, such as sacks, boxes, casks, bales, etc., it is not possible to obtain expedition and economy on so high a scale. Each unit requires more individual attention. The speed of flow is governed by that at which individual packages can be delivered to a conveyor and received from it at the other end. Where there is a sufficient succession of cargoes of the same commodity, the quay and its appliances may be devoted to import purposes, the vessel being moved to another quay for loading outwards, especially if the character and quantity of the export traffic justifies special appliances.

Meat.—A good example is provided in the frozen meat trade at such ports as London, Bristol and Southampton. Mechanical handling in this case is very fully adopted and whole cargoes of carcasses are conveyed into cold storage on runways in practically one continuous movement. This type of conveyor is probably one of the most economical in use at the ports; the initial outlay on construction is small, the structural framework being light, while operation costs per ton are reduced to a minimum owing to the large quantity handled.

Fruit.—The handling of fruit cargoes at ports in this country has received some attention in recent years. The fact that they are both fragile and perishable has done much towards the employment of mechanical means for their discharge. Take, for instance, the banana trade. At Bristol, the importers have installed plant on the quay at which the vessel is berthed and mechanical elevators and conveyors are brought into use for the discharge of the bananas. The elevator is lowered into the hold and the bunches of bananas are placed into pockets formed as the canvas belt travels. The bunches, thus raised, are discharged on to conveyor belts and taken to the shed for rapid distribution by road or rail. For handling the same traffic, other ports have portable elevators which are lifted upon the ship. These elevate the fruit from the hold and place it upon portable runways on the quay.

#### Miscellaneous Cargoes: Coal and Timber.

A large proportion of the work of the ports of this country consists in handling a great variety of goods, without any uniformity in size, weight or shape of package and no great quantity of any one class. For such work the cost of providing such conveyors and of placing them temporarily in position for handling small quantities outweighs any possible economy.

Cranes.—For dealing with the very miscellaneous collection of articles known as "general cargo" the crane cannot seriously be challenged. The earliest quay cranes were of the fixed type, but these soon gave place to those which could move along the quay to suit a ship's hatches. These again gave place to the "portal" type of crane, which allowed a line of railway wagons to pass through the framework of the body. A still further improvement has been the "semi-portal" type which has only its front wheels on the quay, the back wheels running on an overhead support carried upon the wall of the quay shed. This allows of much greater freedom for cargo handling operations.

Further improvements in design have been greater height and outreach: i.e., the introduction of a luffing motion of the jib, and, later still, the adoption of devices for producing a level-luffing travel of the load. In respect of operation, modern improvements have been in the direction of greater lifting power, higher speeds in all motions and ease of control. All these refinements tend towards a greater efficiency in power, time and cost. Provided with suitable slings, etc., a crane can readily handle any general cargo, such as bags, casks, boxes, cases and machinery.

The earlier quay cranes were mostly operated by hydraulic power; but to-day electric cranes are found everywhere, the choice depending upon several factors which it is unnecessary to examine here. As a rule, quay cranes are from 1½ tons to 3 tons lifting capacity, with occasional cranes of 6 to 10 tons power—the great bulk of a cargo consisting of, say, 5 or 6 cwt. lifts.

Quay cranes are limited to operation upon their own rails, whose gauge necessarily is much greater than the standard railway gauge. They cannot, therefore, be travelled from one berth to another, but locomotive steam cranes, of 3 to 5 tons power, provide a very useful alternative for berths not having their own cranes, and also for general lifting purposes behind the quays. The ordinary crane deposits its load either in wagons or lorries or at the door of the quay shed. For transport within the shed, overhead travelling cranes are often provided, but they require a large volume of traffic to justify their cost.

A modern introduction into dock work has been the self-propelled electric truck which possesses many great advantages for the local transport of general goods; used in conjunction with quay cranes it enables a high efficiency of traffic movement to be secured in the discharge, or loading, of a vessel. Another modern development has been that of the petrol-electric "mobile" crane of one or two tons lifting capacity.

For all general cargo movements at the docks these two latter appliances will be difficult to supersede. In the handling of general cargo they are being rapidly adopted and found successful, probably because they fulfil the true requirements of traffic flow. While the speed alone is not equal to that of mechanical conveyors they have other merits outweighing this disadvantage; the directions to be taken by the units are not confined even temporarily to one fixed line, many can be employed on the same work and drivers can thread their way through traffic of every kind and each unit can move without affecting its successor. Although this method requires the leaving of a certain proportion of access lanes for the trucks themselves to traverse, the combined efficiency and economy will probably be superior to underhung overhead cranes on account of the much heavier initial cost of installing the latter.

I conclude my remarks on the subject of cranes by quoting from Sir David Owen's presidential address:—

"What is apt to be forgotten is that for the handling of general cargoes such as I have already alluded to, consisting of goods packed in cases and bags of varying dimensions, the only appliances of any use are cranes, sometimes roller runways and, in certain cases, electric trucks and

*Modern Dock Facilities—continued*

ordinary hand trucks, the last named of which cannot be beaten for many purposes.

"I have visited many ports in the United States of America for the purpose of studying this problem, and have found there, where human ingenuity has gone to great lengths in mechanical appliances, a general absence of such appliances for the handling of general merchandise on the quays, the work of discharging and loading vessels being mostly left to the ship's own gear. There is nothing in the United States to compare with the enormous number of quay cranes in most British ports, but it is true that for the handling of articles in bulk, i.e., grain, ore, coal, sulphur, limestone, and so on, there is abundance of up-to-date plant of a special and expensive character. Although the machines are so costly to construct, the goods dealt with by them are of such vast volume that the cost of operating per ton is small. It was, however, borne in very strongly upon me that for the handling of miscellaneous cargoes the only appliances available were those of the universal type such as cranes, trucks, etc., which I have already mentioned."

**Coal Shipping.**—As regards coal, Britain is an exporting country. Its vast deposits of coal constitute one of the principal national assets, and the value of the coal exported provides a considerable portion of the price paid for the imports of foodstuffs. As the coalfields are widely distributed over Britain, the shipping of coal has been developed at a number of ports, notably the Mersey ports, the Bristol Channel ports, Dover, the Humber, Tees, Wear and Tyne ports, Blyth, the Firth of Forth ports and the Clyde. Coal is almost invariably brought to the port in railway wagons, and the problem of transference therefrom into the hold of the carrying vessel is solved in several different ways.

Perhaps the simplest and earliest method was that adopted on the Rivers Tyne and Wear and at Blyth, viz., the construction of timber staiths from the high ground to the water's edge. The wagons were run out by rail upon the top of the staith, the hopper doors of the wagons were opened and the coal flowed by gravity down a shoot which guided it and delivered it into the vessel. These staiths continue to function well at the present time, the principal improvement introduced consisting of Hancock escalator anti-breakage appliances designed to prevent or control the free fall of coal into a ship's hold.

At other ports, however, where the neighbouring land areas and railway approaches were more nearly at sea-level, it was economically impossible to provide costly and lengthy staging, such as was in use at the Tyne and elsewhere, and mechanical devices had to be provided at the quayside to lift the wagon of coal to such a height that gravity would thereafter convey the coal through a shoot to the ship. Lord Armstrong, who was a pioneer of hydraulic machinery in this country, invented the hydraulic coal hoist as being the simplest appliance for the purpose and, subject to improvements in detail, it is still the principal type of coaling appliance in use.

A few coaling cranes have been at work for many years and continue to give a good account of themselves. From the point of view of anti-breakage they are good, since they can lower the wagon of coal down to the ship's deck before tipping and very much lower if the hatch of the vessel will allow it. The coal breakage difficulty has recently been met by the adaptation of the Hancock anti-breaker for use with hoists.

At the Port of Leith, in order to provide for an additional hoist in one dock without heavy cost in dock wall construction, movable hoists have been installed in such a way that three hoists now operate where only two could previously be used. In order to feed coal to the hoists, rapid-moving traversers are used to convey the full and empty wagons between the hoist and the railway service point.

The temptation to treat coal more as a fluid and to employ conveyors for its transport, as in the case of grain, etc., has led to the introduction of belt conveyors at several ports, but, largely for two reasons, they have not been adopted universally. The first reason is that the various qualities of coal differ so largely in size, while the belt conveyor is not well suited for large coal. The second reason is that the belt conveyor is not of itself in any sense an anti-breakage appliance and is handicapped by the necessity of discharging the coal from wagons on to the conveyor, and at this point trouble and breakage will occur. The employment of a belt conveyor still calls for some form of anti-breakage appliance. Ingenious devices are now being tried, with varying success, to meet this requirement.

At Leith the new hoists are equipped with an anti-breakage box, holding 5 tons and operated by an 8-ton crane specially provided on the hoist frame. This enables the coal to be lowered swiftly from the point of the shoot to the bottom of the vessel's hold and there slid out down the sloping-plate bottom of the box into the vessel's hold. The box can be operated with satisfactory rapidity.

**Timber.**—A brief reference should be made to the handling of timber at the quayside, which is a problem presenting considerable difficulty owing to the great variety in shape and dimensions of logs, spars, battens, deals, etc. The destination of the cargo is usually at some distance from the ship and the timber must be laid down for a time upon the quays.

Any crane to be effective for such a purpose must command a considerable area and requires a large volume or weight of traffic to justify its first cost. Ordinary merchant scantlings are generally handled by man power, upon which method no great improvement has been devised. In Hull, in cases where a merchant's timber yard is situated not far from the quayside, bogeys running upon rails are employed. This method involves considerable expenditure upon rails and bogeys, which latter become laid up under load for lengthy periods; but presumably in these cases it is found ultimately to be economical. The runabout cranes previously mentioned might be useful but would involve heavy expenditure in providing a paved surface upon which they could operate freely without excessive wear and tear.

*Some Comparisons of British and Continental Ports.*

In order that such a comparison may properly be indicated and understood, it is necessary to have clearly in mind the relative factors in the situation.

The outstanding features of difference between Continental and British ports are (1) the possibility of much cheaper works of construction abroad owing to the smaller tidal range generally; (2) the very large volume of trade which passes through individual ports on the Continent, and (3) the difference in ownership and administration.

**First Cost.**—Regarding the first point, it may be of interest to state that at the three largest British ports and the three largest Continental ports, the average tidal range is 9-ft. and 30-ft. respectively. At Rotterdam the range is 6-ft., and at Bristol, 40-ft. This results in a vast difference in the capital expenditure called for in British as compared with Continental ports, in the construction of dock walls, quays, locks, and all major works of protection. The President of the Institute, in his inaugural address, stated that the burden of capital expenditure at the Port of London represented about sixpence per net register ton of the shipping using that port.

**Volume of Traffic.**—The main traffic through the principal Continental ports is that of foodstuffs and material in raw condition and in bulk. They comprise a large proportion of the supplies of a very numerous population.

The three ports of Rotterdam, Antwerp and Hamburg supply the import requirements of nearly 100,000,000 people; whereas in Britain a population of, say, 50,000,000 is supplied through many ports, of which the seven largest are London, Liverpool, Bristol, Hull, Manchester, Glasgow and Leith, while there is also a considerable number of smaller ports. Rotterdam in particular is a transit port through which far more traffic passes than is destined for Holland itself.

In order to consider the comparison more carefully, I select the Port of Rotterdam. Similar considerations hold at other ports, but in varying degree. The large volume of traffic through Rotterdam alone would justify heavy capital expenditure upon works without seriously increasing the net costs of handling. But there is little necessity for such works; owing to the presence of a fine navigable river capable of carrying large craft for a great distance into Germany, the bulk of such traffic as grain is brought from overseas in large whole bulk cargoes and is there transferred to barges of up to 3,000 tons capacity, which continue the transport to Germany.

Such transhipment does not necessitate the building of costly quays and wharves. It merely calls for sufficient water space; the transference of the cargo is performed by powerful individual floating craft which can, of course, proceed to the vessels requiring them. A cargo of 12,000 tons can readily be transferred to, say, four of the big Rhine barges, and the vessel can promptly be released. The capital constructional work required is the provision of a spacious waterway; and this has been supplied by the excavation of the "new waterway" from the Hook of Holland to Rotterdam with suitable connections to the River Rhine, by means of dredging, which is the cheapest method of excavating the sand of Holland.

Under such conditions the traffic handling work at the port can be carried out at an exceedingly cheap rate per ton, and it will readily be seen that invidious and critical comparisons between British and Continental ports in the matter of costs of working and consequent charges are unfair in that they are not true comparisons of similar conditions. Of course, the Port of Rotterdam has also been provided with a number of quays for the handling of general cargoes, but as only about 20 per cent. of its total traffic is of such a character, the cost of the works has not been great.

Hamburg is also largely a transit port, about 60 per cent. of its traffic being handled afloat as at Rotterdam and passed on up the River Elbe into the interior.

*Modern Dock Facilities—continued*

At Antwerp, where a greater proportion of the total trade is handled at river quays and in enclosed docks, the difference in conditions is not so marked and the port is largely served by canals.

Gdynia and Danzig.—Some mention should be made of the ports of Gdynia and Danzig on the "Polish Corridor."

A surprisingly rapid and efficient development has taken place at both these ports, especially at the former. No expense has been spared in building harbour works and equipping them with extensive and powerful plant, largely for the shipment of coal from Silesia. But the quantities to be handled, coupled with the political considerations involved, have produced facilities out of reach of any possible emulation in a British port.

Ownership and Administration.—The foregoing should be sufficient to give a general idea of the comparison between British and Continental ports, but there is a third point which should be mentioned, and that is the fact that British ports have to stand upon their own feet in a financial sense. They are generally owned by a public trust which constructs and administers the port and its equipment, and they have no financial resources or assistance apart from their own statutory revenues. There are one or two special cases, such as Manchester, Bristol and the railway-owned ports, but these do not nullify the broad statement that British ports are generally self-supporting.

On the Continent, however, the funds for approved dock construction are provided, as a rule, by the State, with contributions from the local authorities and chambers of commerce to whom are allocated the proceeds of certain port dues. The foundation for this practice is, no doubt, the fact that ports are the gateways of the nation's external trade and that they are therefore of primary interest to the State, as well as to the immediate area of the port.

At Rotterdam, Amsterdam and Antwerp the docks belong to the cities; Hamburg is administered by a joint port authority under an interstate agreement between Prussia and Hamburg; at Bremen the harbour is owned by the city and the docks by the State; Copenhagen and some of the Mediterranean ports are run by special Commissions.

Generally speaking, it may be said that the facilities available in the various ports, both British and Continental, are those which the traffics have produced and that, apart from continued study and improvement of working detail, no revolutionary alteration is either called for or economically possible. Traders who light-heartedly make critical comparisons between British and Continental port facilities and charges should, in fairness, be careful to compare like with like, unless indeed the critics themselves are prepared to put up the money necessary to provide what often can be described only as luxuries.

**LEGAL NOTES***Duties of a Harbour Authority*

THE owners of the s.s. "Aberhill" sued the Harbour Board of Tayport for damages for alleged undue detention of the vessel outside the harbour, which detention was said to have been due to fault or neglect of duty on the part of defendants. It was averred by plaintiff that on the morning of 5th September, 1927, the vessel arrived off Tayport Harbour with the intention of entering the harbour and discharging a cargo, but that owing to an accumulation of silt in the entrance channel immediately outside the piers of the harbour, for which defendants were responsible, it was found impossible in the then condition of the tides to take the vessel in, and that it was not until 9th September that with higher tides she was able to enter. Defendants were sued as being responsible for the delay, and liable for consequent loss to plaintiff. The grounds of action on which liability was said to attach to them were two: (1) that there was a common law duty on them as owners of a harbour to take reasonable steps to ensure that not only the harbour itself was safe, but that the entrance to it was also safe and fit for use and for ingress and egress from the harbour by vessels suitable for the accommodation of the harbour, and that defendants were in breach of that duty; (2) breach of warranty, in respect that defendants publicly advertised the harbour as *inter alia* affording a certain depth of water, and thus represented it as suitable for vessels whose draught enabled them to be accommodated by that depth; that such advertisement and representation constituted an invitation to such vessels to make use of the harbour, and impliedly warranted that the depth of water in the entrance channel was sufficient to enable such vessels to pass into and out of the harbour—which depth defendants failed to maintain and were thus in breach of their warranty. It was not averred that defendants were in breach of any statutory duty in regard to the condition of the entrance channel.

Defendants pleaded that the action was irrelevant. In support of that plea they stated that, as was admitted by plaintiff, they did not own any part of the Firth of Tay outwith the limit of the boundary of their harbour property, that they had no control over any part outwith that limit, and that accordingly there was no duty resting on them to provide or maintain a safe access to the harbour outside that limit; that the duty of providing a safe passageway for ships outside Tayport Harbour rested upon Dundee Harbour Trustees; that it was admitted that the accumulation of silt which was said to have prevented the vessel from entering was immediately outside the piers of the harbour, and therefore outside the limit of their harbour and outside the limit within which any duty rested on them; and that in any event there was no duty on a harbour authority simply as such authority and where the approaches to the harbour were not owned or controlled by them, either at common law or under a representation and advertisement as in the present case to maintain the access and entrance to the harbour in a safe and fit condition.

Plaintiff's Counsel founded strongly on the well-known case of *Bede Steamship Co. v. River Wear Commissioners* (1907) 1 K.B. 310, but before the legal decisions there arrived at as

to the duty and obligation resting on the harbour authority could be accepted as applicable to any other case it was necessary to ascertain whether or not there was any material difference on the facts. Collins, M. R., expressly stated that the decision rested on the circumstances of that case, and both he and Farwell, L. J., stated that the duty resting on a harbour authority, at common law or by inference of a warranty, to take reasonable care to maintain access to the harbour depended on how far the access was vested in them or was under their control. That was a question of fact in each case, though the ascertainment of the fact might depend on the construction of a statute. In the *Bede* case it was admitted that the access was part of the undertaking of the harbour authority, and it was also a fact in the case that there was no other authority having control or jurisdiction over the access and the water outside the harbour.

Evidence as to the whole facts and circumstances was accordingly taken, after which judgment was given in favour of the defendants on the following grounds in law; (1) that in respect any representations made by defendants as aforesaid regarding the depth of water at the harbour were made by them in the knowledge that the approach channel had become silted to the extent of possibly causing obstruction to ships, and that they had all along had *de facto* control of the channel and assumed responsibility for dredging it, they were or would be liable for any loss or damage due to such obstruction, but (2) in respect no representation of sufficient depth of water on 5th or 6th September was made by defendants they were not liable in damages for detention of the "Aberhill" on these dates; (3) in respect that it had not been proved that owing to insufficient depth of water the "Aberhill" could not have navigated the entrance channel on 7th, 8th and the morning of 9th September, in relation to which dates defendants represented that there would be sufficient depth for the "Aberhill" to enter the harbour, defendants were not liable in damages for detention of the ship on these dates.

The full report of the case makes up a bulky document which space does not permit us to reproduce, but the foregoing gives a fair outline of it, and considering it as a whole the general propositions in law may be deduced that ownership and use of a harbour does not *per se* carry with it the duty of maintaining a safe way to the harbour and the question whether or not representation made regarding the depth of water in a harbour involved responsibility for access to the harbour, is one depending on circumstances such as the terms of the representation, the nature of the access, etc., but if the owners of the harbour make representations as to the depth of water in their harbour which amount to an invitation to shipowners to send ships there in the knowledge of a certain condition of the approach channel involving risks which were exceptional and not ordinarily incidental to ships approaching, and if in such knowledge the harbour owners conceal or at any rate fail to disclose the existence of that risk to a shipowner accepting that invitation, they will be liable for loss resulting to the shipowner in consequence of the defective condition of the channel.

## North-East Coast Notes

### Signs of Better Trade.

THE improvement in trade on the North-East Coast to which reference was made in these notes last month seems to be well maintained, and there would appear to be definite indications that trade in the near future will be better than even the figures then quoted gave promise of. In the all-important coal trade, not only are shipments being maintained, but they are increasing, if only slowly. The need that has been found to increase the county quotas for both Northumberland and Durham is a very significant fact, and the huge demand that exists for graded and washed steams points the same way. Six months ago it was estimated that about a million tons of small coal which could not be disposed of were lying dumped on the ground around the pits; to-day the same fuel, when graded, is finding a ready market in Scandinavia, and it is thought that in a further six months' time the great heaps of coal will have profitably vanished. The shipping position is also improving; idle vessels in the Tyne have dropped from 180 to 127 about the middle of September, and the Cleveland iron and steel industry, referred to later on, is in a better state than it has been for a long time, and a further indication of trade improvement, which should not be overlooked, is contained in the better railway traffic returns.

### Coal Trade Statistics.

The estimated shipments of coal from the Tyne, Blyth, Wear and the Hartlepoons for the seven months to the end of July were put at 13,881,154 tons, compared with 14,113,569 tons in 1932, a decrease of 232,415 tons. By the first week in September the figures had risen to 16,031,450 tons, compared with 16,111,500 tons in 1932, or only 80,050 tons less, showing that distinct headway had been made and the leeway overcome.

The figures of shipments issued by the London and North-Eastern Railway for their staiths at Tyne Dock, Dunston and Blyth also give further proof of better trade. Taking the totals for the four weeks ended September 2nd, the figures were: Tyne Dock, 145,519 tons (increase 40,203 tons); Dunston, 298,207 tons (increase 19,194 tons); and Blyth, 352,749 tons (increase 73,774 tons). The reports of the Tyne Improvement Commission tell the same tale. The shipments for the three weeks last available were: August 19th, 247,308 tons (increase 23,262 tons) August 26th, 248,946 tons (increase 11,764 tons); and September 2nd, 227,792 tons (increase 34,767 tons).

The Russian steamer "Minsk" arrived at the Albert Edward Dock, North Shields, in the latter part of August, with the largest cargo of pit props ever imported into the dock. It consisted of 5,200 loads from Leningrad. The "Minsk" carries a crew of sixty, is 450-ft. long and 10,000 tons dead-weight.

### Tyne Quay Extension.

At the meeting of the Tyne-Tees Shipping Co., Ltd., in Newcastle in August, Sir Arthur Sutherland stated that when the time was favourable the company proposed to extend their Gateshead quay up to the Swing Bridge. Property had been bought for that purpose. The import tariffs, however, had greatly affected their Continental trade, particularly in the carriage of vegetables. In three months their revenue went down by £10,000, but the vegetables supplied from the Continent were not being replaced by home produce, and therefore the vegetable trade might come back to the company. When the time and trade warranted it, the extension of the quay up to the Swing Bridge would be proceeded with.

The stream known as the Gut at Willington Quay on the Tyne, flowing past the rope works of R. Hood Haggie and Son, Ltd., and into the Tyne at the works of the Wallsend Slipway and Engineering Co., Ltd., is being straightened out. The scheme is being carried out by Messrs. R. Hood Haggie and Co., and when completed will enable craft to pass right up. Land will also be reclaimed for possible extensions to the works. The stream will be straightened to a distance of about 300 yards and will have a depth of 15-ft. A jetty is to be constructed, and there will be considerable piling work.

### Smoke Elimination.

An interesting experiment in smoke elimination on steamers was made at the end of August on the Tyne Improvement Commissioners' launch "Sir William Stephenson." Members of the Improvement Commission, including the chief engineer, Mr. R. F. Hindmarsh, attended the demonstration. Coal which gives out the greatest volume of smoke was shovelled on to the fires, and the launch's funnel was quickly belching out clouds of dense black fumes. A word from Mr. Garvie, of Aberdeen, who was conducting the experiment, and the black stream was cut off and funnel top cleared, leaving only the quiver of hot air. Again and again the smoke was allowed to

appear only to be cut off as soon as the "eliminator" came into action. The "Sir William Stephenson" provided an example of the economies effected by the apparatus. It burns Welsh coal costing about 42s. per ton. With this apparatus the vessel, it is claimed, could use Northumbrian coal at a cost of 12s. 6d. to 14s., while consumption is also lower. The installation was made by Messrs. Thomas Firth and John Brown, Ltd., of Sheffield and Newcastle, for the British Smoke Eliminator, Ltd., London.

### More Trade Figures.

The official trade returns by the River Wear Commission show that the coal and coke shipments for July were 27,744 tons in excess of the same period in 1932, with a total of 342,522 tons. There is still some leeway to make up, however, for the shipments for the seven months of the year at 2,296,544 tons were 447,001 tons down on the like period of 1932. The imports, too, are better, for the July total was 35,617 tons, compared with 32,863 tons for the same month of the previous year; for the seven months the figures were: 1933, 163,751 tons; 1932, 165,934 tons.

Shipments of coal and coke from the Hartlepoons during August amounted to 264,518 tons, an increase of 7,833 tons over the shipments in the corresponding month of last year. For the first eight months of the year, however, the shipments show a decline compared with 1932 of 55,676 tons, the amount shipped being 2,063,568 tons.

### Improvement in Tees Steel Industry.

The details of the iron and steel shipments for August placed before the members of the Tees Conservancy Commission at the beginning of September afforded further evidence of the improving state of the trade. August is usually the duller month of the year, owing to the holidays, but iron and steel shipments from the river in that month totalled 39,682 tons, which, with the exception of May, was the heaviest monthly figure this year. Pig iron shipments totalled 12,848 tons, of which 8,367 tons went coastwise, and 4,481 tons abroad. The latter figure is the highest for this year. Manufactured iron and steel shipments reached 26,834 tons, compared with 22,583 tons in July. A gratifying feature is the resumption of steel shipments to Argentina, totalling 2,370 tons, while over 5,000 tons were shipped to South and East Africa. The effect of the tariff duties on imported iron and steel is strikingly reflected in the fact that during the past ten months only 11,954 tons were imported, as against 112,582 tons for the corresponding period of 1931-1932 and 53,399 tons in 1913-14.

### The Institute of Transport: Sessional Programme, 1933-34.

Informal Meeting, October 31st, 1933.—It is regretted that, owing to illness, Mr. R. E. Morley will be unable to initiate the discussion on "Rail and Road Services Contrasted" at this meeting. Mr. M. F. Barnard (Member) has consented to open a discussion on "The Duties of a Modern Transport Manager."

Ordinary Meeting, December 18th, 1933.—The subject of the paper to be read by Mr. R. J. M. Inglis at this meeting will be "The Engineer in Transport."

Ordinary Meeting, January 8th, 1934.—The subject of the paper to be presented by Sir Archibald Hurd at this meeting will be "Shipping and the State: Recent Developments."

Informal Meeting, January 30th, 1934.—The discussion to be opened by Mr. J. S. Pool Godsell will be on "Road Accidents—with special reference to pedestrians."

### Rhine Shipping in August.

The Duisburg-Wesel Chamber of Commerce reports on Rhine shipping in August as follows: The seasonal improvement in traffic during the past few months became slack in August. Shipments of coal stimulated by the summer rebates showed a considerable decrease both with regard to inland sales and exports owing to the completion of stocks which has meanwhile taken place. Arrivals of bulk goods from Rotterdam and downstream traffic slackened during the period under review. Consignments of pulp wood of Russian, Finnish, Czechoslovakian and Lithuanian origin arriving together with Northern American wood travelled to the Upper Rhine. Owing to lack of demand offers of vessels and barges were numerous. The situation in Rhine shipping, particularly of independent shipping, therefore became worse. The waiting period for independent ships lying at Ruhrort is usually six to eight weeks. The cargo boat and motor-boat services showed a further decrease. There was no particular change in Rhine-sea traffic. Only in a few cases the loading capacity of the ships was fully utilised during the above-mentioned period.

## *The New Drydock—Lock at St. Nazaire*



*Fig. 3. The Lock completed, ready for flooding, with the Sliding Gates erected within it.*



*Fig. 4. Inner Gate-chamber, with its covering deck in the raised position.*

# The New Drydock—Lock at St. Nazaire\*

(Translated from the French)

THE development of shipbuilding yards at St. Nazaire and the ever increasing dimensions of ocean liners have led to the endowment of the port with a huge entrance lock, capable of utilisation also as a drydock for the largest commercial vessels.

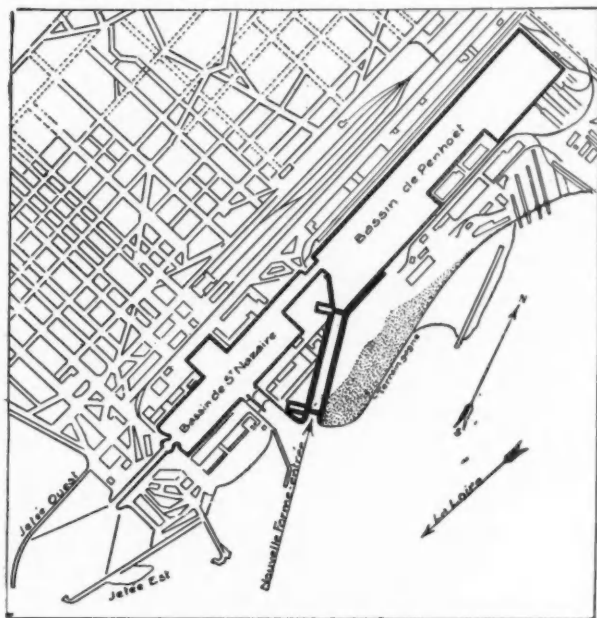


Fig. 1. Situation of the Works in St. Nazaire.

The works were let to contract in December, 1928, in the character of reparations in kind, and after competitive tendering, to Christiani and Nielsen, of Hamburg, who are represented in France by the firm of the same name established in Paris. The situation of the St. Nazaire yard is shown by Fig. 1.

The works, as shown in Fig. 2, comprise an entrance lock, two gate chambers, two subsidiary quays adjacent to the inner end of the lock (one of which was added during progress and carried out entirely under standard French conditions), two knuckles at the river end of the lock, two enclosures for the gate-operating machines, a pumping station for dewatering the dry dock, two rolling gates and gear.

## The Lock.

The lock (Fig. 3) measures 350 metres in effective length, with a width of 50 metres at bottom and 53.07 m. at ground level. This level being at an elevation of +7.35 m., the invert is set at -9.35 m. and the sills at -8 m., giving a depth of water over sills of 12.64 m. at ordinary high tide, 13.46 m. at equinoctial spring tides and 8 m. even at the lowest tides.

\* Published by kind permission of "Science et Industrie," Paris.

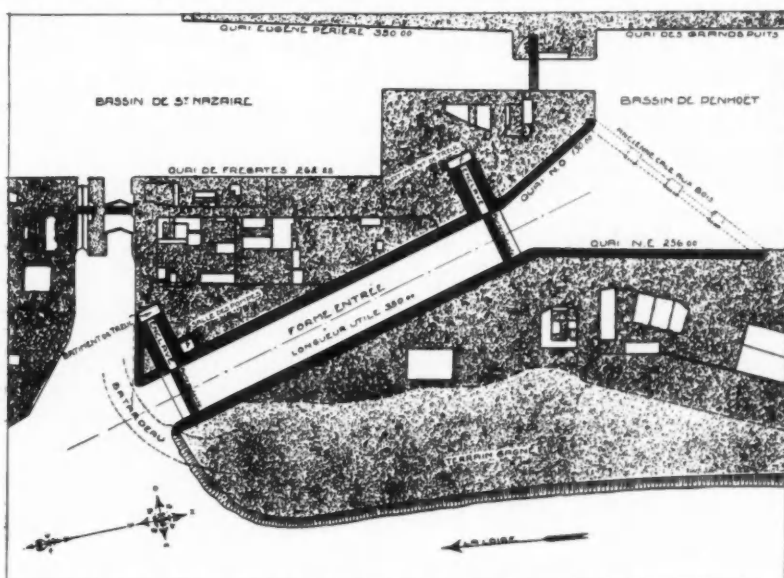


Fig. 2. General Plan of the Works.

The invert of the lock is provided with reinforced concrete keel-blocks, bedded on the rock, enabling it to be used as a dry dock. The lock is closed in by two rolling gates, designed to hold up the water in either direction and functioning at any state of the tide.

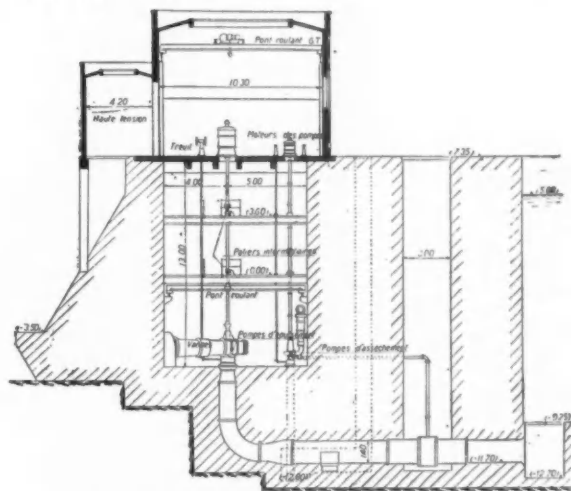


Fig. 5. Pumping Installation. Cross Section.

The opening of the passage is effected by sliding back the gate into its chamber.

## The Gate Chambers.

Owing to the great length of the gates, the chambers to house them are works of considerable magnitude. Their length is 58.90 m. (inner gate) and 60.90 m. (outer gate); their

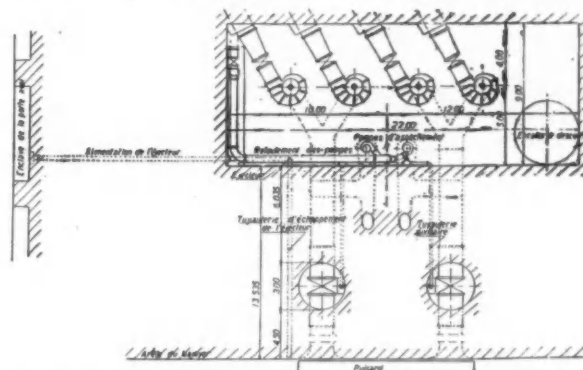


Fig. 6. Pumping Installation. Horizontal Section at the level of the dewatering pumps.

width 10.60 m., and depth 16.50 m. Fig. 4 shows the chamber for the inner gate, covered with the deck or road-bridge that serves to close the cavity when the gate is slid out across the passage. This bridge is lifted by jacks while the gate is operated; it is then brought to rest on the upper edges of the side walls of the chamber, which is its normal position in service.

In this Fig. 4 may be seen the orifices of the levelling culverts, which turn downward to pass underneath the floor of the chamber. It will also be noticed that the side walls are built with a series of arched recesses in them. The only object of this arrangement is to facilitate, by giving more room, the maintenance and repair of the gates, as well as their dry-docking for examination.

The chamber for the outer gate is formed in just the same way.

## External Quays at Inner End.

The West Quay is 130 metres long and connects the inner gate-chamber with the old quay of the Penhoet Basin. The wall is built of heavy blocks, founded on the rock, like those of the lock, as will be presently described.

The East Quay is 214 metres long. It is carried on piles, of a length up to 32 metres (105-ft.), and has been constructed on a patent system of Messrs. Christiani and Nielsen. It connects the abutment of the inner gate with the old quay called "Intake Quay."

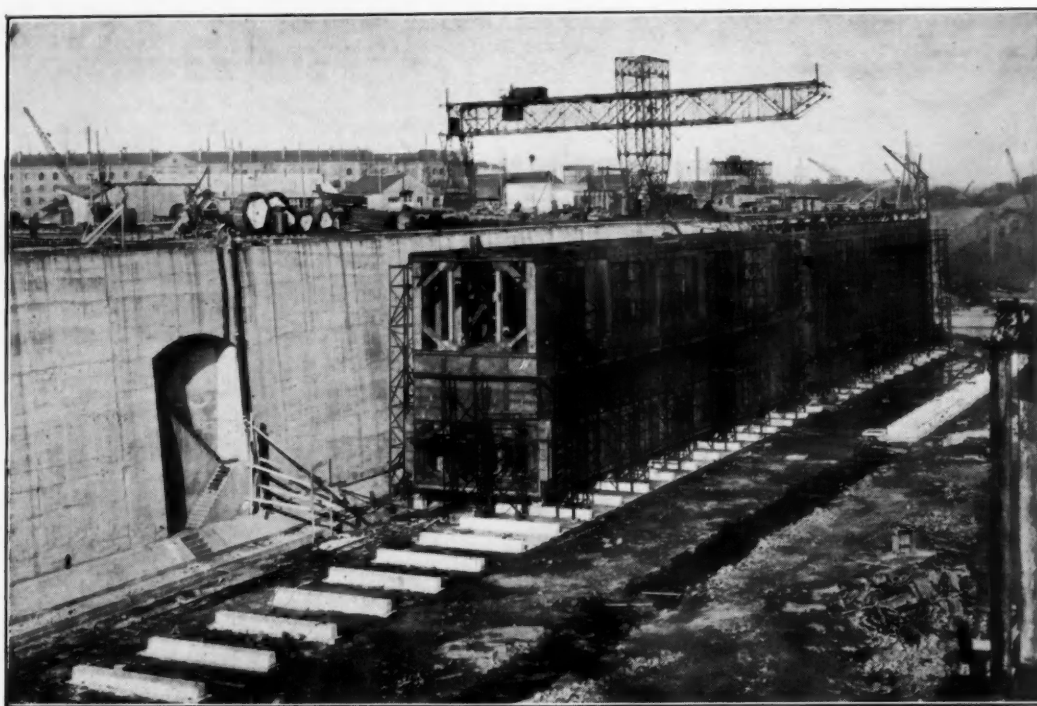
*The New Drydock—Lock at St. Nazaire—continued*

Fig. 7. Inner and Outer Gates, under erection in the Drydock. At the bottom, the reinforced concrete keel-blocks, on which vessels will rest.

**Knuckles.**

The two knuckles at the outer end of the lock are of solid concrete, founded on rock, and have no features of particular interest.

**Winch Houses.**

The structures housing the gate winches are entirely of reinforced concrete with flat roofs of the same material.

**Pumping Station.**

The pumps are installed in an extension of the mass concrete walls adjoining the outer gate-chamber. The machinery and control gear are enclosed in a reinforced concrete building over the pump chamber. (See Fig. 5.) This building was sub-let to the Rateau Company of Lille.

The dewatering of the dry dock is effected in part by gravity with the fall of the tide, and in part by a series of centrifugal pumps, arranged as shown by Figures 5 and 6. The series is composed of four pumps, delivering through pipes of 1-metre diameter. The chief features of these pumps are given hereunder, viz.:—Maximum power taken by each pump, 350 h.p.; mean power, 280 h.p.; speed, 485 r.p.m.; mean delivery, under

head of about 10 metres, 1,700 litres per second = 20,000 gallons per minute.

Under these conditions and ordinary tides, the dry dock is emptied in 14 hours (6 hours by gravity and 8 hours by pumping with 4 pumps), or in 22 hours (6 hours by gravity and 16 hours with 2 pumps), the total volume pumped being about 190,000 cubic metres.

In addition, two drainage pumps, each delivering 200 litres per second under 18 metres of head, with 75 h.p. motors, keep the dock dry when emptied.

The provision and installation of these pumps was entrusted to Messrs. E. Baudrey and L. Bergeron, with the Electro-Mechanical Company as sub-contractors.

**Sliding Gates.**

The rolling or sliding caissons or gates, which are of large dimensions, as shown by Figs. 8 and 9, were erected within the dry dock itself, with the aid of a travelling gantry, to be seen in Fig. 7.

These gates are of steel, of the horizontal rib type, and provided with a buoyancy chamber, always submerged, having the function of reducing the load on the supports. Each of

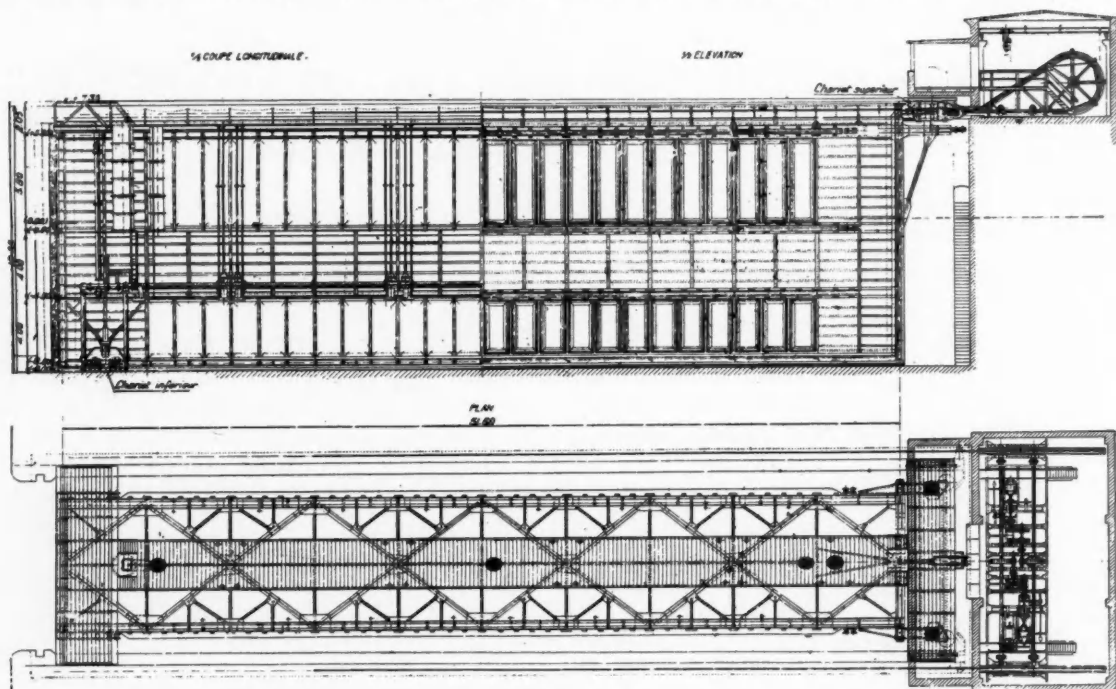


Fig. 8. Outer Gate: Plan, half-longitudinal section and half-elevation.

# The New Drydock—Lock at St. Nazaire—continued

the gates can be withdrawn into one of the side chambers already described. These chambers can be closed by means of a portable dam enabling them to be dried out for examination and attention.

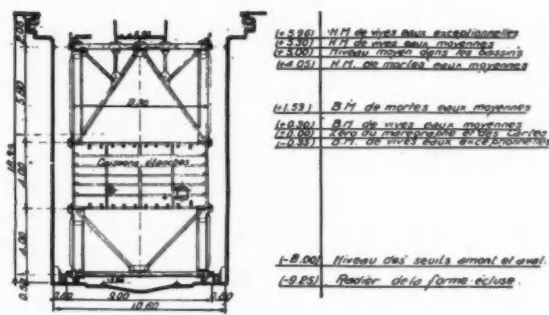


Fig. 9. Outer Gate: Cross Section.

The gates move on rollers, being mounted for the purpose on two carriages, one at low level forward and the other at high level in the rear, running on two pairs of rails.

The dimensions of each gate are as follows: Length overall, 52.10 m.; breadth (including bearing strips), 8.90 m.; height (between centres of top and bottom ribs), 13.80 m.; height overall, 15.10 m.; volume of buoyancy chamber, 1,726 cubic metres; weight, in air, 1,250 tons; weight, submerged, with preponderance due to filling ballast tanks, 40 tons.

The gates are designed to withstand the full head of water when bearing only on the vertical stops in the side walls, in case for any reason the bearing sill at the bottom should give way.

The main framing comprises four horizontal ribs, covered on both faces, inner and outer, with watertight skin plating. The top and bottom ribs are of lattice construction, the two intermediate ribs have solid webs and form the top and bottom of the buoyancy chamber. This chamber, placed thus in the middle of the height, is divided into ten compartments and extends throughout the whole length of the gate (Fig. 10). A certain number of these compartments form ballast chambers, the others are air chambers, the regulation of the former serving to obtain the degree of buoyancy required for flotation and manœuvring of the gates in the conditions intended. The forward compartment houses the pumps for regulating the water ballast. The volume of the air chambers is such as to enable the gate to float, when completely emptied, and to be removed like an ordinary floating caisson in case of need. The inner and outer faces are fitted with hard-wood bearing strips to ensure watertight contact with the stops and sills.

The rolling carriages present the following features:—

1. The lower carriage, having two bogies with two wheels each, supports the forward end of the gate and travels on rails 4.50 m. apart.
2. The upper carriage, having two bogies with four wheels each, travels on rails 11.50 m. apart, built into the masonry of the side walls; it supports the rear end of the gate by a spring hanger and transmits to it through a spring coupling the impulse of the operating mechanism. This method of suspension thus allows a certain play, vertically and horizontally, of 5 cm. either way from the normal, to allow for movement when pressed against the bearing faces.

The gate-operating arrangement is of a novel kind. The pull is exerted on the upper carriage (Fig. 8). The normal effort required to move the gate is 26 tons, but the machinery has reserve power sufficient to cause the gate, in case of failure

of the lower carriage, to slide on timber keels fixed underneath the bottom deck. In such case the winches can develop a pull of 50 tons to achieve this purpose.

Movement is communicated to the gate by means of a chain with very large links, no less than 2.40 m. long, connected by rollers. These chains are guided by sheaves fixed in the masonry walls and transmit the motion by tension and compression. The return is effected by a large pulley, to be seen at the extreme right of Fig. 8.

The controlling mechanism is composed of two D.C. motors of 65 h.p., 940 r.p.m., at 440 volts. These motors are served by a Leonard group enabling the gate to travel at a speed of 17 cm. per second. Alternatively one motor alone will move the gate at 10 cm. per second. The whole movement of a gate thus occupies about 5 minutes.

## Details of Execution

### The Lock.

The excavation was carried out in free air. At the river end it was enclosed by a cofferdam (Fig. 2) formed of two rows of steel sheet-piling, driven down to rock, about 20 m. apart and connected by cross-ties. The space between the two rows of piling was filled in with the run of the general excavation.

This dam, designed for a normal bottom, gave rise to difficulties because the rock was reached at a lower level and a steeper slope than was expected. It was found necessary in consequence to modify the outline of the dam and to strengthen it by long anchorages carried back to solid ground. It was not until about March, 1931, that success was gained in making this protective work sound throughout. Fortunately it was possible to push forward the works in the northern sections and thus avoid being delayed by the troubles attending the early stages of construction of this dam.

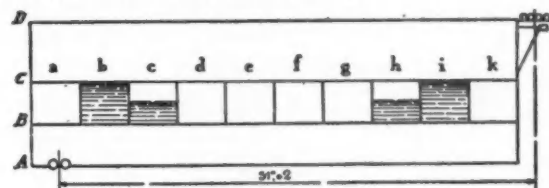


Fig. 10. Sliding Gate: Diagram.

- a. Forward compartment, housing the bilge pump and ballast pump.  
b, c, h, i. Ballast tanks, filled for normal service.  
d, e, f, g, k. Air chambers.

By gauging the quantities of water entering the trial holes sunk on the site of the proposed works it had been ascertained that the strata were comparatively impervious, and the contractor had accordingly reckoned upon the feasibility of excavation without special precautions and without risk of serious difficulty with water. This forecast was amply justified by the event. On the other hand, there arose difficulties due to the nature of the rock. In fact, some of the gneiss encountered was unusually decomposed. The reason for this is probably that the water of small streams formerly flowing in the locality had filtered down to the lower beds and disintegrated them by their acid content.

This rock of variable character, partly soft and partly hard, appears to have caused unexpected troubles, because uncertainty as to the best means to employ for breaking it up occasioned fractures of machinery to an unusual degree, with difficulties as to transport, and in consequence seriously impeded the course of the works. From this cause there resulted delays in the progress of the excavations.

A<sub>1</sub> A<sub>2</sub> COUPE LONGITUDINALE 1:1000

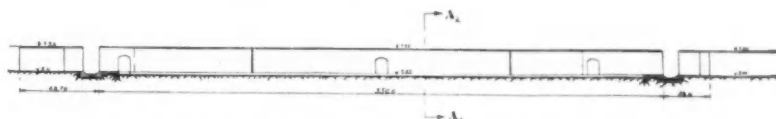


Fig. 11. Longitudinal Section on the Axis of the Drydock—Lock.

A<sub>1</sub> A<sub>2</sub> COUPE TRANSVERSALE 1:200

A<sub>2</sub> A<sub>2</sub> COUPE TRANSVERSALE ORIENTALE 1:200

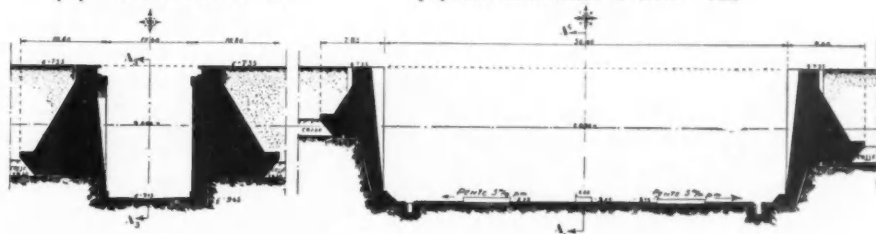


Fig. 12. Cross-section of Outer Gate Chamber

Fig. 13. Cross-section of Drydock—Lock.

The New Drydock—Lock at St. Nazaire—continued

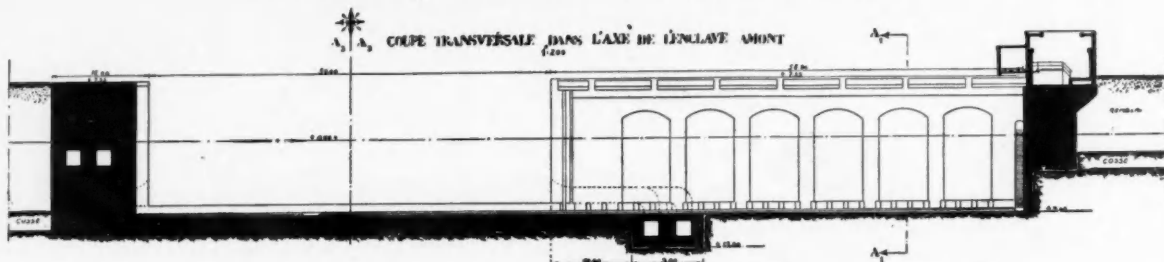


Fig. 14. Section across Lock and along Axis of Outer Gate-chamber.

Since it was of the utmost importance to finish the works in time to allow the passage of the "Super Ile de France," from the Penhoet Yard, immediately after launching, the contractor had to make special efforts by increasing his plant and adopting continuous night-and-day working to an altogether abnormal extent.

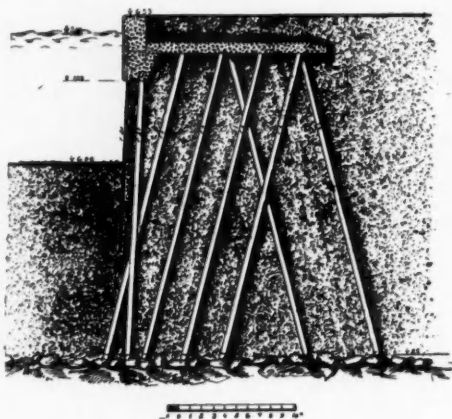


Fig. 15. Section of East Quay.

About 400,000 cubic metres of soft soils and 200,000 metres of rock were taken out. The spoil deposited in the Loire, on the east of the site, has served to extend the reclaimed area on that front. The plant employed included 5 steam-shovels, 2 grab excavators, numerous cranes and winches, 5 locomotives, 50 trucks of 6 cubic metre capacity and about 4 kilometres of track.

The heavy masonry work (Figs. 11 to 14) was executed in coarse concrete, having 246 kilos of cement to the cubic metre of finished work. The total quantity of concrete amounted to about 160,000 cubic metres. The concrete, in a semi-fluid consistency, was deposited by gravity, either by means of a concreting tower or by concrete mixers working in conjunction with endless band conveyors and a series of shoots. The machines operate alongside the work, the materials required being hauled in over a railway system comprising 6 kilometres of track. The forms employed, as necessitated by the great variety of profiles due to the very variable foundation levels, were of timber shuttering partly made up in panels beforehand, the remainder built up in place to suit the work.

The excavation for the northern sill and the abutment block of the inner gate, on the side opposite to the gate chamber, was difficult to execute. At this spot the surface of the rock was at considerable depth and of very poor quality, while the superincumbent strata of soil were very variable, with pockets of running sand in many places. It was necessary here to adopt a process of construction by stages, excavating for the sill and the abutment block in separate narrow trenches, separated by sheet-piling, strutted against portions already concreted. This gradual advance took up more than a year. In certain parts of these excavations it was necessary to carry the foundations down to the level of 18 m. below datum, 25 m. below ground level.

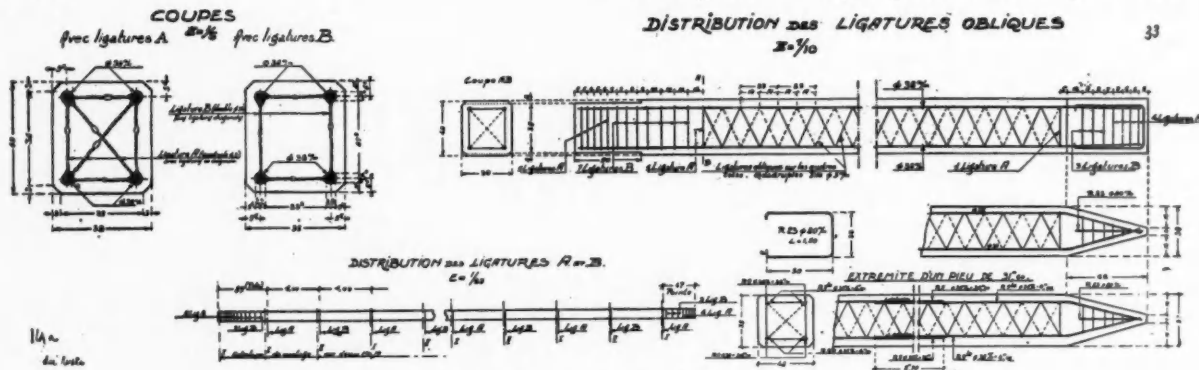


Fig. 16. Details of Piles.

The Gate Chambers.

The construction of the chambers to house the gates offered no feature or incident of special interest.

The Two Inner Quays.

The West Quay was built in the same way as the lock walls. The junction with the old quay of the Penhoet Dock was carried out within the protection of two lines of sheet-piling driven on either side of the existing wall and extending for about 50 metres along the new wall, to obviate any seepage from the Penhoet Basin, standing at 5 or 6 m. above datum. This protective work was entirely successful.

The East Quay is a work of special interest. The solid bottom is very low all along the quay, being about 24 or 25 metres below datum. Overlying the rock there is nothing but mud, more or less soft. The ground surface had at one time been solidified by a deposit, only about 2 metres thick, of filling containing a certain quantity of coarse shingle, the existing level being about 7 m. above datum.

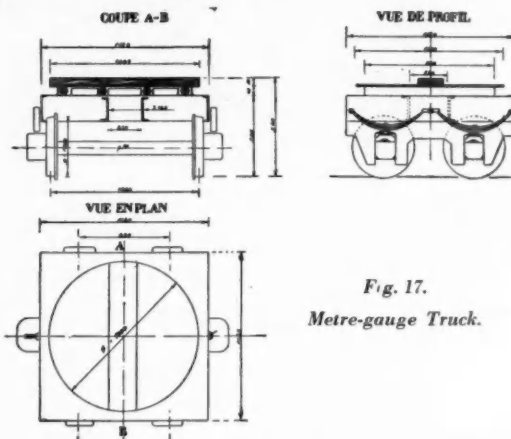


Fig. 17. Metre-gauge Truck.

The depth of the basin alongside the wall being about 13 to 15 m., there must be a forward earth-pressure of considerable force, but not easy to calculate, owing to the characteristics of the mud (angle of repose, cohesion, etc.) being imperfectly known and difficult to reduce to figures.

A form of construction was chosen that is based upon a patented system of Messrs. Christiani and Nielsen. The principles of this system appear in the section (Fig. 15).

The great depth called for piles of unusual length—up to 32 metres. The piles are of rectangular section, 38 cm. by 42 cm., without shoes, and having diagonal wire lacing instead of stirrups. The details of the pile reinforcement are given by Fig. 16. The advantages of this system are firstly that there is a greater safeguard against damage during manipulation and, further, that the steel skeleton is much more rigid and therefore more safely handled in transit from the steel-assembling to the concreting yard (Fig. 18).

The piles weighing up to 12 tons require very powerful and well-designed plant for their transport and driving. After moulding and maturing they are loaded on special trucks (Fig.

*The New Drydock—Lock at St. Nazaire—continued*

Fig. 18. Compression Piles ready for driving.

17) fitted with turning plates. It goes without saying that the points of support have to be very carefully chosen in order to subject the piles to the least possible strain during transport. The loading on to wagon is effected by means of travelling gantries (Fig. 19).

Driving is done with a pile-frame 35 metres high and a 6-ton steam hammer (Figs. 20 and 21). The frame travels on a carriage 26 metres long, which allows it to operate over the whole width of the quay wall without excessive changing. The carriage runs on three lines of rails 12 metres apart. The carriage girders are hinged to ensure even bearing on the treble track. All the motions of the frame are effected mechanically.

The pile to be driven is brought to the foot of the frame on the truck already mentioned. It is slung in two places and lifted first in a horizontal position to a height approximately equal to the distance from the sling to the end of the pile. Then the upper rope only is hauled in, until the pile is vertical. The pile is brought into position with its head entering the helmet, which is fixed below the hammer. The pile is now lashed to the frame. The frame is moved into position by traversing on the lower carriage, turning if required, and is tilted to the desired batter. The pile is now in place and driving can commence. With piles of such exceptional length, every operation is fraught with some risk, but no accident has taken place.

The actual driving has presented no difficulty. Obviously any hard driving before the greater part of the pile has entered the ground might be dangerous through causing excessive vibration of the long unsupported length. The ground on the site being fairly soft, but having a harder upper crust, it has been necessary in some places to pierce this crust in advance by means of a dummy pile, to obviate the danger of vibration. Driving has

attained the rate of 10 piles in 8 working hours, but this record was evidently not sustained regularly.

The connecting length comprising the first 40 metres of quay at its southern end, which would take the rub of vessels passing into the lock, was of heavier construction and special design (Fig. 22).

It had been hoped to construct this connecting length in the same manner as the lock walls—of mass concrete founded on the rock. In view, however, of the great depth of the rock and the nature of the overlying strata (soft mud, with pockets of running sand), this form of construction had to be abandoned. It might have been feasible to do the foundation work by compressed air, but the fact that the sinking had to be executed in a slope (of very unstable soil) led to this method being abandoned, for fear that the caisson during sinking would be forced out of place by unbalanced lateral earth pressure.

The section ultimately adopted has a solid mass of concrete heavy enough to offer firm resistance; it is carried on reinforced concrete piles; in short, it forms a transition between the type adopted for the main length of this East Quay and the profile of the lock side walls.

The work comprised in the East Quay was not carried out under the system of reparations in kind, like the other works herein described, but it was entrusted to the French firm, Christiani and Nielsen, of Paris. The order to commence the works could not be given until January 15th, 1932; obviously it was essential to complete the parts nearest to the lock before this was put into service by the passage of the new ship at the appointed date of October 29th, 1932. The contractor succeeded in completing the connecting length by August 31st, and by the date fixed for opening 60 metres of the ordinary quay were also finished. Thus the execution of these works did not hinder in any way the utilisation of the lock.

*South-East and South-West Knuckles.*

These parts of the lock present no special feature, being formed of mass concrete founded on the rock. Only their execution was delayed and hampered by the fact that these knuckles, which, according to the original plans, had been inside the cofferdam and protected by it, came actually in the middle of the dam. As already explained, the outline of this dam had to be modified, and this alteration brought it too close to the work. Consequently the construction of the two knuckles could not be undertaken until the lock had been completed and the outer gate installed. The knuckles were eventually built within single-skin dams of steel sheeting driven to the rock. It was rather difficult to make these enclosures sufficiently watertight, because the driving of the piles through the remains of the main cofferdam gave a good deal of trouble. This section of the work was not indispensable for the first passage of the new liner, and it could therefore be left until the last.

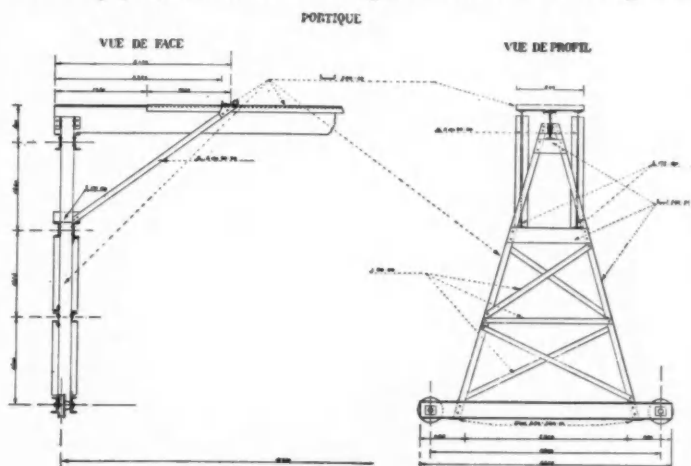
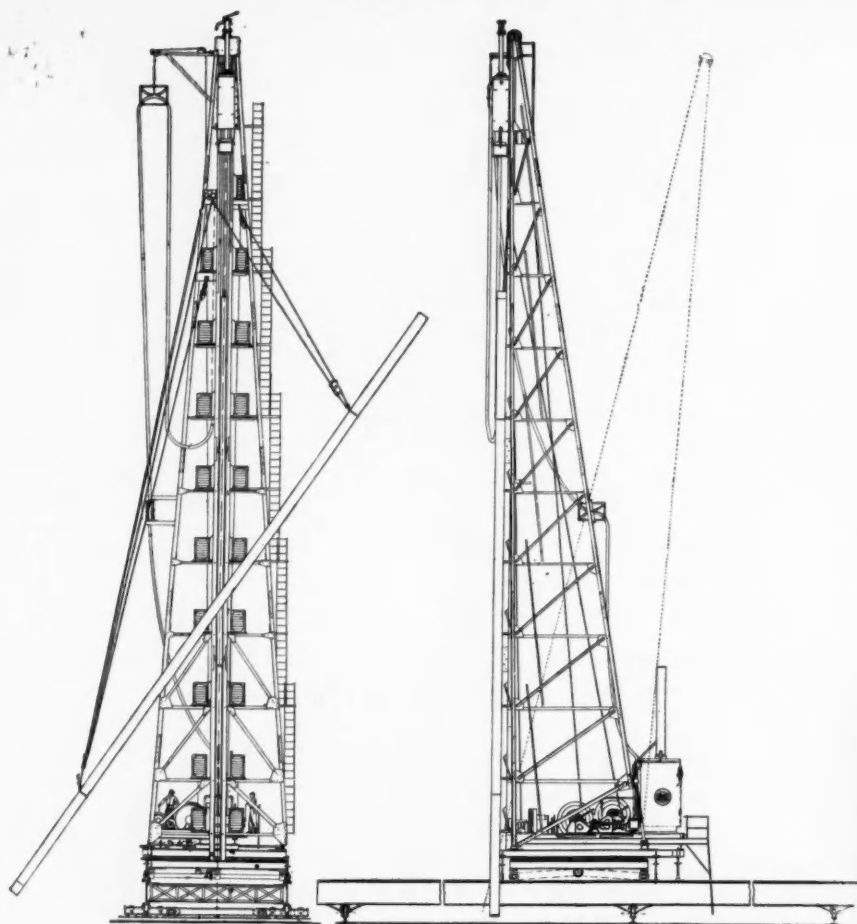


Fig. 19. Travelling Gantry.

The New Drydock—Lock at St. Nazaire—continued



Figs. 20 and 21. 35-metre Pile-frame.

Concrete Mixtures.

The greater part of the concrete used in the works was coarse concrete composed of 3 parts of broken stone to 2 parts (by measure) of mortar having 500 kilos of cement per cubic metre of dry sand.

The remainder is ballast concrete of similar composition, except that the broken stone is replaced by gravel. We will not enlarge upon this second variety, whose mixing and placing are analogous to those of the coarse concrete.

There is a comparatively small quantity of reinforced concrete for purposes too special to be worth mentioning here.

In regard to the coarse concrete, the definition already given needs supplementing from a practical standpoint, for strictly speaking there is no dry sand. The sand used is river sand obtained by dredging in the Loire above Nantes; it is, therefore, always damp, but owing to its transport by barge and its speedy employment in the work, its water content is practically constant. Further, the broken stone is, as we shall see, of fairly large gauge, and it is always possible for the concrete to be less uniform than it is in theory supposed to be. For this reason special experimental determination has been resorted to.

and not pass through a 1 cm. ring. No attempt was made to establish the proportions of stone of different sizes, for the quarry deliveries were of uniform character throughout, and in the light of the preliminary experiments it was possible to ensure, with the material available, a very satisfactory mixture.

(b) Sand.—The special specification lays down that the sand should not contain more than 30 per cent. of fine grains of less than  $\frac{1}{2}$  millimetre, nor contain any grains larger than 10 mm. Sand dredged from the Loire fulfils these conditions.

(c) Cement.—The cement used was for the most part "Hochofenzement," a German cement, of which the quality was controlled on the site in a laboratory specially installed by the contractor before the work of concreting began.

SHUTTERING.		STRIPPING.		CONCRETING	
7	5	3	1	4	2

Fig. 23. Sequence of Operations.

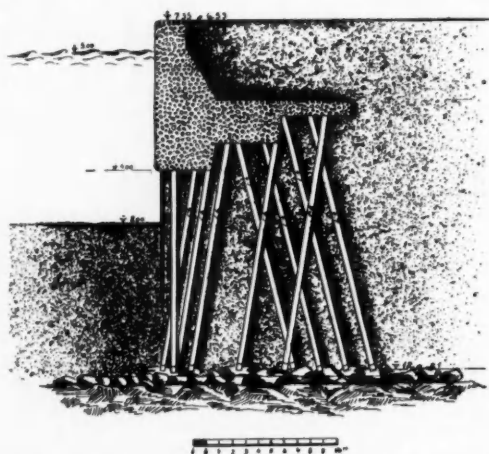


Fig. 22. Section of East Quay, at end nearest to Lock.

Materials Employed.

(a) Broken Stone.—The stone was obtained from approved quarries. When broken it must pass through an 8 cm. ring

Mixture of Concrete in Practice.

In order to determine the most suitable mixture and to facilitate control, experiments were undertaken as already mentioned, and these were carried out in the laboratory of the "Ponts et Chaussées" (Roads and Bridges Department) at Paris. These experiments were made with materials taken from the contractors' stocks under the supervision of the local office of the "Ponts et Chaussées."

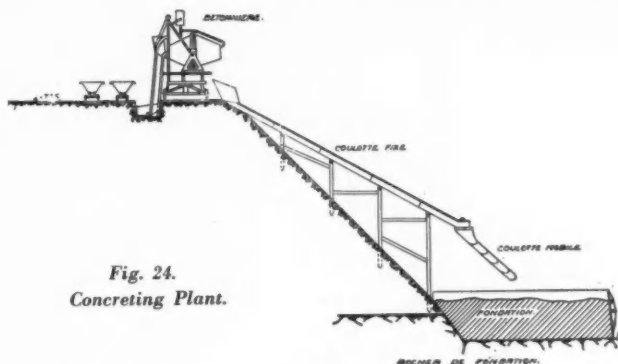
The results obtained were very consistent, and the laboratory drew from them the conclusion that, in order to obtain in the work one cubic metre of concrete of the specified quality, it was necessary to have materials in the following proportions, viz.: 246 kilogrammes of cement, 584 litres of damp sand as delivered, 587½ litres of broken stone.

The quantity of water was taken at about 180 litres per cubic metre, to allow the concrete to slide freely down shoots inclined at 30 degrees and thus permit of easy placing in position without deterioration.

Preparation of Concrete.

As stipulated in the specification, the concrete was machine-mixed in mixers of 1 cubic metre capacity. The largest mixers were of the turning-down type, emptied by tipping. The concrete was mixed alongside the work with materials brought in by truck.

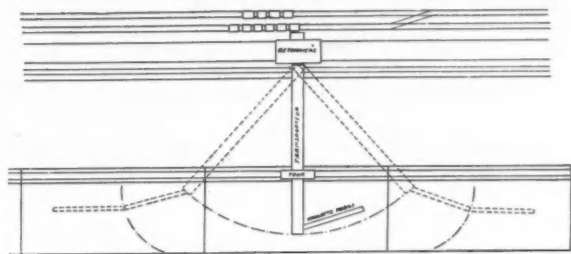
## The New Drydock—Lock at St. Nazaire—continued

Fig. 24.  
Concreting Plant.

## Placing Concrete.

According to the specification, the concrete had to be used "in semi-fluid condition, such as to enable it to spread easily without need for ramming." In view of this definition, the method adopted was to run the concrete into place by gravity by means of metal shoots having an inclination of not less than 30 deg. The concrete being nearly all at or below the natural ground level, it was sufficient in all but special cases to have the mixers only slightly above ground level. The only exception was the pumping station, for which a small concreting tower was employed.

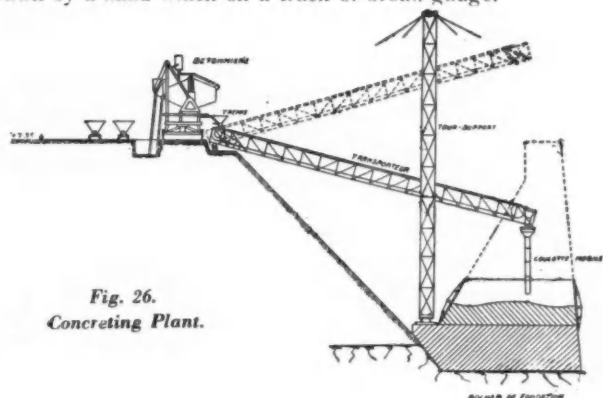
On the other hand—since the open trenches, being of considerable depth, had slopes of corresponding width—it was necessary to arrange for rather long horizontal conveyance of the concrete. This horizontal movement was effected by two distinct methods: (a) intermittent transport by trucks, (b) continuous transport by band conveyors.

PLAN SCHEMATIQUE DE L'INSTALLATION  
Fig. 25. Concreting Plant.

The quantity to be placed not being concentrated, but spread over many hundreds of metres, the first necessity was that the plant should be portable, moving speedily and easily on prepared tracks. The method of transport by trucks, requiring a rigid horizontal track and therefore staging, did not meet the case, not being flexible enough. The method of using light band conveyors, on the other hand, requires no scaffolding if the support is well designed. The lay-out arranged, allowing continuous operation, enabled depositing to be carried out in the sequence indicated by Fig. 23. Under this arrangement there is no waiting. One section is shuttered and another stripped, while a third is concreted. To render this operation easier, a pouring height of 3 to 4 metres was adopted. But it may be repeated that it is indispensable, if continuous working is to be assured, with speed and economy, for the concreting plant as a whole to remain light and easily portable, and not to become heavy and cumbersome.

How has this combination been arrived at? Figures 24, 25, and 26 will show.

1. The mixer is mounted on a stout timber wheeled carriage, drawn by a hand winch on a track of broad gauge.

Fig. 26.  
Concreting Plant.

2. Between the mixer and the conveyor is a measuring hopper attached to the mixer.

3. The conveyor is formed of a steel lattice beam, 22 metres in effective length, carrying the motor and an endless rubber band 70 cm. wide.

Taking into account the time required in mixing and measuring, the conveyor can easily dispose of all that the mixer can deliver. A mean output of 20 cubic metres an hour is quite feasible. The quantity handled by a conveyor, moreover, is a function of its width.

The beam is supported at the mixer end by a bogie travelling on an auxiliary track. The connection between conveyor-beam and bogie is effected by a swivel connection, turning every way. At its outer end the beam extends beyond the point where, at two-thirds of its length, it is slung by wire ropes from a steel gantry specially formed, and itself travelling on a low-level track. This movement of the framing permits of horizontal travel by the conveyor, which is an important motion that the wide portal of the gantry allows with great freedom. The suspension ropes

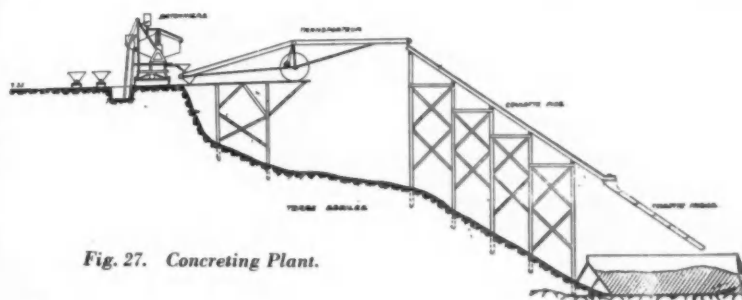


Fig. 27. Concreting Plant.

are wound by small hand winches, making the conveyor adjustable also in a vertical plane. The swivel joint on the bogie allows for all these motions.

4. The system is completed by a series of shoots slung at the outer end of the transporter.

In order to avoid unnecessary removals, the transporter is of such a length that, with the mixer straddling two sections, it is possible to pour into both sections without moving the mixer. Figures 24, 25 and 26 give a good idea of the method. In order to furnish a level and horizontal bed for the travelling gantry, as seen in Fig. 26, the lowest lift of each block was deposited without the transporter, but by means of the shoots only.

It would obviously be useless to have portable plant if its movement were rendered impossible by reason of uneven ground. The system was brought into play after excavation was done for the north gate-chamber and the plant was proportioned to suit the dimensions of the slopes taken by the soil—the slopes having remained stable for some months—and allowing a generous factor of safety. This allowance, however, proved to be quite inadequate.

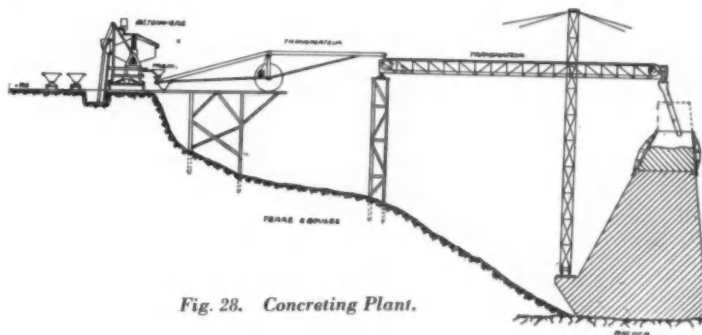


Fig. 28. Concreting Plant.

A slope depends not only upon the angle of repose that it takes, but also upon the depth of the excavation. Now, the poor quality of the rock often necessitated an increase in the depth, the persistent rains throughout a whole year and even the ensuing summer caused slips or landslides of considerable extent to take place, and in soils of this character, when a slip starts, there is no knowing where or when it will end.

Hence it followed that forecast and fulfilment were two quite different things. Figures 27, 28, 29, 30 and 31 show the modifications that were introduced during the course of the work.

1. Fig. 27.—Owing to the slip, the distance from the mixer to the foundation was too great for pouring direct through shoots. It became necessary to employ an additional conveyor, not provided for, 18 metres long and 50 cm. wide, which fed the shoots originally intended.

2. Figs. 28 and 29.—Shoots were replaced by the original transporter B, which required extensive staging. It may be observed that if the transporter A is much smaller, this is because

### The New Drydock—Lock at St. Nazaire—continued

it must be of light weight, for it is inadvisable to place heavy machinery on yielding ground.

In any case, the plant as a whole is no longer portable. For every change of position it is necessary to rebuild a big staging and to move heavy machines by improvised means.

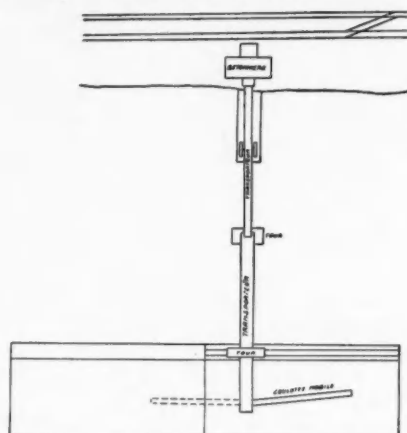


Fig. 29. Concreting Plant.

3. Figs. 30 and 31.—In order to cope with this difficulty and to be able to pour three sections at a time when possible (in the sequence shown by Fig. 31), which was the only method avoiding long stoppage of the mixer for the stripping of the section concreted and the shuttering of the next one, the following disposition was made:—

(a) The conveyor A, with conveyor B beyond it, for pouring the central section.

(b) At the end of B another conveyor, C, is placed, for concreting the section shown (in Fig. 30) on the left of the central one.

(c) Another conveyor, D, is arranged on staging on the ground, to feed shoots for concreting the right-hand block, though at a lower level than the others.

Certainly this differs widely from the original system, and naturally the output is very much less. The employment of conveyors of lighter type, which are necessarily narrow, in order to obviate the necessity for heavy staging, reduces the quantity delivered.

Moreover, the necessary shifting from place to place entails the expense of losing many working days, as well as the repeated construction of staging.

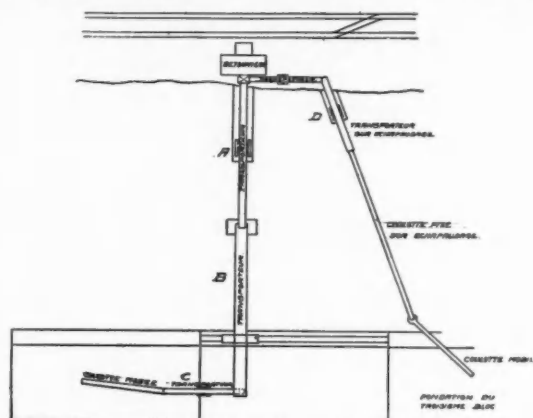


Fig. 30. Concreting Plant.

necessitated complication in the method employed. The experience here gained with this method of concreting has therefore been neither good nor bad. In the face of numerous obstacles, success was achieved in depositing this large quantity of concrete in the time allowed. The point brought out is rather that the system, while good in itself, proved to be too rigid and not readily adaptable to fresh circumstances when the working conditions (slope, distance, etc.) are not the same as were originally foreseen.

1	2	3
4	5	6
7	8	9
10	11	12

Fig. 31. Sequence of Operations.

The successful result obtained is to the credit of the Department of Public Works and of the contractors, Messrs. Christiansi and Nielsen. In particular the engineers of the Roads and Bridges Department are to be congratulated, together with their head, M. Bonnisseau, Chief Engineer of the Department ("Ponts et Chaussées"), the director of the port.

## Irish Harbour Matters

### Dundalk

#### Dundalk Harbour Board.

A proposal that owing to declining revenue the charge for harbour dues should be increased, was deferred for the present at a recent meeting of the Dundalk Harbour Board.

Mr. T. F. McGahon, chairman, said that their position showed that they were £1,500 down in receipts this year, compared with the same period last year. Necessary dredging was being carried out, and they were now paying out more than they were getting in.

Mr. Glendon said that their position was due to the industrial depression which was general, and while he did not like to increase rates, he thought something would have to be done if they were to keep the works going.

Mr. Curtin asked that no further increase be thrown on the merchants at present. They had been expecting a decrease to enable them to meet the bad times which they had been experiencing.

Mr. E. J. Williams said that any further increase would reduce trade and would hit the merchants, who were now paying rates as high as during the peak years of the war.

### Cork

#### Cork Harbour Board.

Although harbour dues for the Port of Cork are down by £5,500 since January last, the Cork Harbour Board has decided to proceed with the Tivoli reclamation scheme for the purpose of giving work to the unemployed.

At a meeting presided over by the chairman (Mr. R. Wallace), a report on the Tivoli reclamation scheme received from the engineer was recommended by the sub-committee and approved. Also on the recommendation of the committee it

was decided to send a copy of the report to the Parliamentary Secretary to the Minister for Finance with a request for his co-operation and for approval of the scheme proposed.

Mr. Saunders, in his report, stated that he had examined the feasibility of providing work for unemployed men by speeding up part of the reclamation at Tivoli with the help of a government grant. The reclamation ground at Tivoli covered an area of 158 acres. To enclose 20 acres would entail the construction of 2,710-ft. of embankment, while 1,950-ft. would enclose 10 acres. An embankment for 20 acres would cost £10,800, and would keep 60 men employed for 18 months. The smaller work would cost £7,800 and would keep employed the same number of men for 12 months. He estimated that 92½ per cent. of the cost would be spent on labour.

Mr. O'Sullivan suggested the possibility of borrowing £20,000 to go ahead with the scheme. By doing that they would be doing something definite with 10 or 20 acres, instead of being involved in a big and indefinite scheme.

Alderman S. French (Lord Mayor), believed that they had an excellent chance of getting a grant which would help them to employ 60 to 70 men for the next 18 months.

### Immingham Dock Statistics.

During the month of August a total of 157 vessels representing a net registered tonnage of 238,595 used Immingham Dock, including 32 vessels totalling 37,407 net registered tons using the Western Jetty coaling berth and 6 vessels of 63,172 n.r.t. engaged on passenger cruises, as compared with August, 1932, when 132 vessels totalling 220,663 net registered tons used the port, including 26 vessels totalling 34,077 net registered tons using the Western Jetty, and 7 vessels of 67,851 n.r.t. engaged on passenger cruises.

## Clyde Navigation Trust

### Deficit on the Year's Working

### Optimistic Outlook

THE Clyde Navigation Trust held their meeting for the presentation of their annual accounts on Tuesday, September 5th. In moving the adoption of the accounts for the year, Mr. Kennedy said that four or five months ago it was hoped that the revenue would so appreciate as to allow of the accounts showing a surplus. Trade, however, did not respond as anticipated, with the result that he had to intimate a deficit on the year's working of £18,251. The revenue for the year was £733,721, against £768,319 in the previous year, a decrease of £34,598. The expenditure charged to revenue was £751,973, a reduction of £22,633. The deficit of £18,251 had been met out of the reserve and depreciation account, which now stood at £1,558,834. The sinking fund and reserve and depreciation accounts amounted together to £3,243,365.

In any comparison of the revenue of almost £734,000 with revenues prior to the year 1930, continued Mr. Kennedy, it had not to be lost sight of that the recent revenues had been considerably diminished by the operation of the Rating Act of the Trust of 1929 and the Local Government (Scotland) Act, 1929. It was estimated that the Rating Act would give relief in dues and charges to the extent of roundly £55,000. Last year the de-rating rebates under the Local Government Act amounted to fully £80,000. To give a more reasonable comparison, these combined sums of £135,000 should, therefore, be added to the revenue of last year.

The tonnage of vessels entering and leaving the port totalled 13,061,225, a decrease on the previous year of 523,462 tons. The total revenue from vessels was less by £8,925 than that of the previous year. The tonnage of goods imported and exported was 5,317,065, a decrease on the previous year of 352,440 tons. The revenue from dues on goods was down by £14,974. Although several items of general cargo had shown an increased tonnage, the trade of the port had suffered severely by the depression in what was known as the heavy industries. As an illustration of that, he quoted comparative tonnages of imports of iron ore. In the year to June 30th, 1914, that tonnage was 1,086,000. In later years it dropped as follows:—1920, 1,002,000; 1930, 555,000; 1931, 180,000; 1932, 77,000; 1933, 33,000.

These are very significant figures, but, happily, there was hope of improvement in the resumption of operations by William Dixon (Ltd.), at their Govan Iron Works, after having been idle for two years, and also in the projected scheme of William Baird and Co., at Gartsherrie. By the starting of these works, not only would there be a large import of iron ore and limestone, but the additional vessels which would accrue to the port in carrying these commodities would also, in many cases, load cargo coal for foreign delivery.

Savings had been effected in practically every branch of the undertaking, and these, in the aggregate, for the two years ended June 30th last, amounted to £104,476. The interest on bond and other debt for the past year was down £729. That decrease was relatively small, but during the current year there should be a considerable reduction in the amount of interest payable.

Extraordinary expenditure on the reconstruction of General Terminus Quay, Plantation Quay, and Plantation Quay shed amounted during the year to £95,833. It was satisfactory to know that work at Plantation Quay was completed on May 31st last, and that the reconstruction of General Terminus Quay would be accomplished during the course of the present financial year. Capital expenditure amounted to £39,412, from which there fell to be deducted unemployment grants amounting to £37,095 and sundry credits amounting to £136, leaving a net total expenditure of only £2,180. The amount of extraordinary and capital expenditure for the current year was estimated at £30,421, almost wholly in respect of General Terminus Quay.

In conclusion, Mr. Kennedy stated that he was glad to be in a position to inform the members that there had been an increase of revenue in each of the past three months compared with the corresponding months of last year, aggregating in all £9,190. The prospects of trade in the immediate future were brighter than for some time past. The port was well equipped to meet an increase in trade, and now they should look forward to better times ahead.

Mr. William Cuthbert, vice-chairman, seconded, and the accounts were unanimously approved.

The chairman said that Mr. Kennedy had referred to the imports of iron ore, showing how seriously the affairs of the Trust were affected by the falling away of that trade. When they remembered such things, as the Irish situation and import restrictions, he thought that they could say that their

revenue, although there was a slight falling-off, was very much as they had expected. Taking everything into consideration, he thought that they had succeeded in meeting the position about as well as they could. The work of the Trust during the year had gone forward without mishap and without special difficulty of any kind. The department of Mr. Harold Ford, the commercial manager, had continued its efforts to bring them into closer touch with countries abroad, and they had had several expressions of appreciation of the work which had been done. More shipments had been arranged this year than in the past. It was also very pleasing that the revenue for the past three months should be greater than that for the corresponding months last year.

At a subsequent luncheon in the reception room of the Trust, Mr. Cuthbert proposed the health of the chairman, and said that since Mr. Robertson had been appointed to that post three years ago the Trust had had a difficult time. They had suffered through the general depression of trade, and circumstances which they could not control had made the running of the Trust's affairs more difficult than for many years. Under conditions like these it was a great thing to know that they had the right man at the tiller.

In a brief reply, Mr. Robertson said that the work of the Trust was interesting, although, thanks to the times they lived in, it had been difficult. He had heard it suggested that the Clyde was a dear port. He thought that in point of management it could stand comparison with any comparable port he knew. It was conducted in the most economical way. It had been disappointing to see month by month statements of falling revenue, and it was a very great pleasure to know that even after three months they could begin to hope just a little. He sincerely hoped that things were going to be a little better, in which case the Trust was ready to meet whatever work was put before it.

Immediately after the luncheon the Trustees and officials boarded the Comet and proceeded down the river to carry out the annual inspection. They paid particular attention to the reconstruction work at General Terminus Quay and Plantation Quay. On the completion of the General Terminus Quay there will have been constructed at that part of the harbour since 1920 (with the exception of a small break at Finnieston Ferry) a continuous length of quayage from Clyde Street Ferry to almost the entrance to Prince's Dock, extending to 1,625 lineal yards, or fully three-quarters-of-a-mile.

### Weser Inland River Shipping in July, 1933.

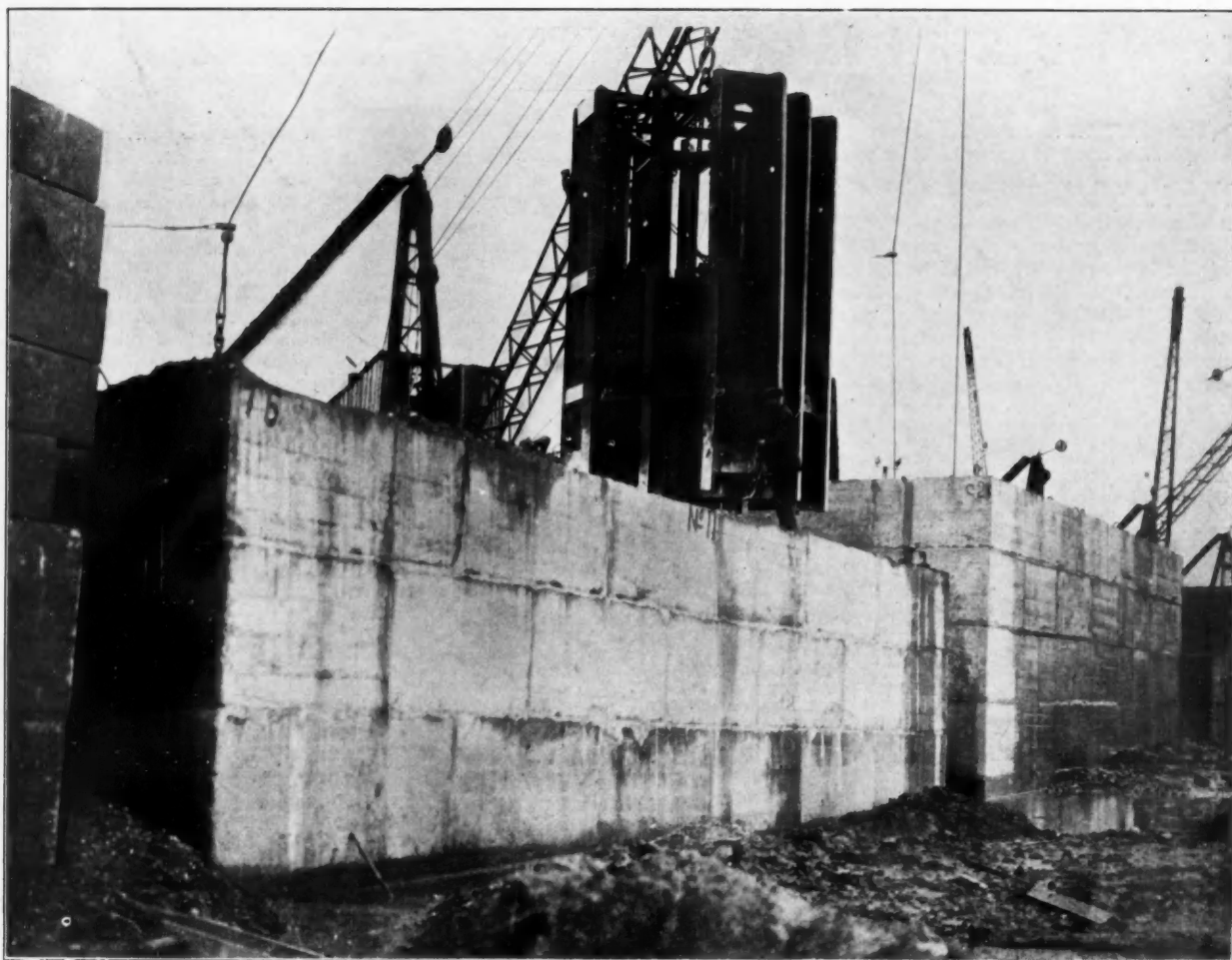
Goods traffic through the Bremen Weser Lock in July, 1933, due to better water conditions, was more considerable than in the previous month. In both directions altogether 138,500 tons passed, which is 14,200 tons, or 11 per cent. more. Downstream transport at 102,900 tons increased by 10,900 tons, or 12 per cent., owing to large arrivals of potash salt, gravel and stones. Coal figures were somewhat behind those of the previous month. Upstream 35,600 tons were carried, being an increase of 3,300 tons, in spite of the fact that no phosphate, pyrites nor rice shipments were made. Piece goods, coal, timber and grain have recuperated. Compared with July, 1932, goods carried were 31,900 tons, or 30 per cent., greater. Downstream goods amounted to 20,900 tons, or 26 per cent. more, chiefly due to greater gravel, stone, potash salt and piece goods transport. Upstream, through increased shipments of piece goods, coal and timber, traffic was 11,000 tons, or 45 per cent. higher.

During the past seven months traffic at 789,900 tons, increased by 59,600 tons, 8 per cent., if compared with the same period of the previous year. The increase, however, was only in downstream traffic, which, with 576,600 tons, rose by 70,900 tons, or 24 per cent., chiefly due to larger shipments of gravel, stones, piece goods and potash salt. Upstream with 213,300 tons, a decrease of 11,300 tons, or 5 per cent., took place, chiefly due to the considerable decrease in grain and flour shipments.

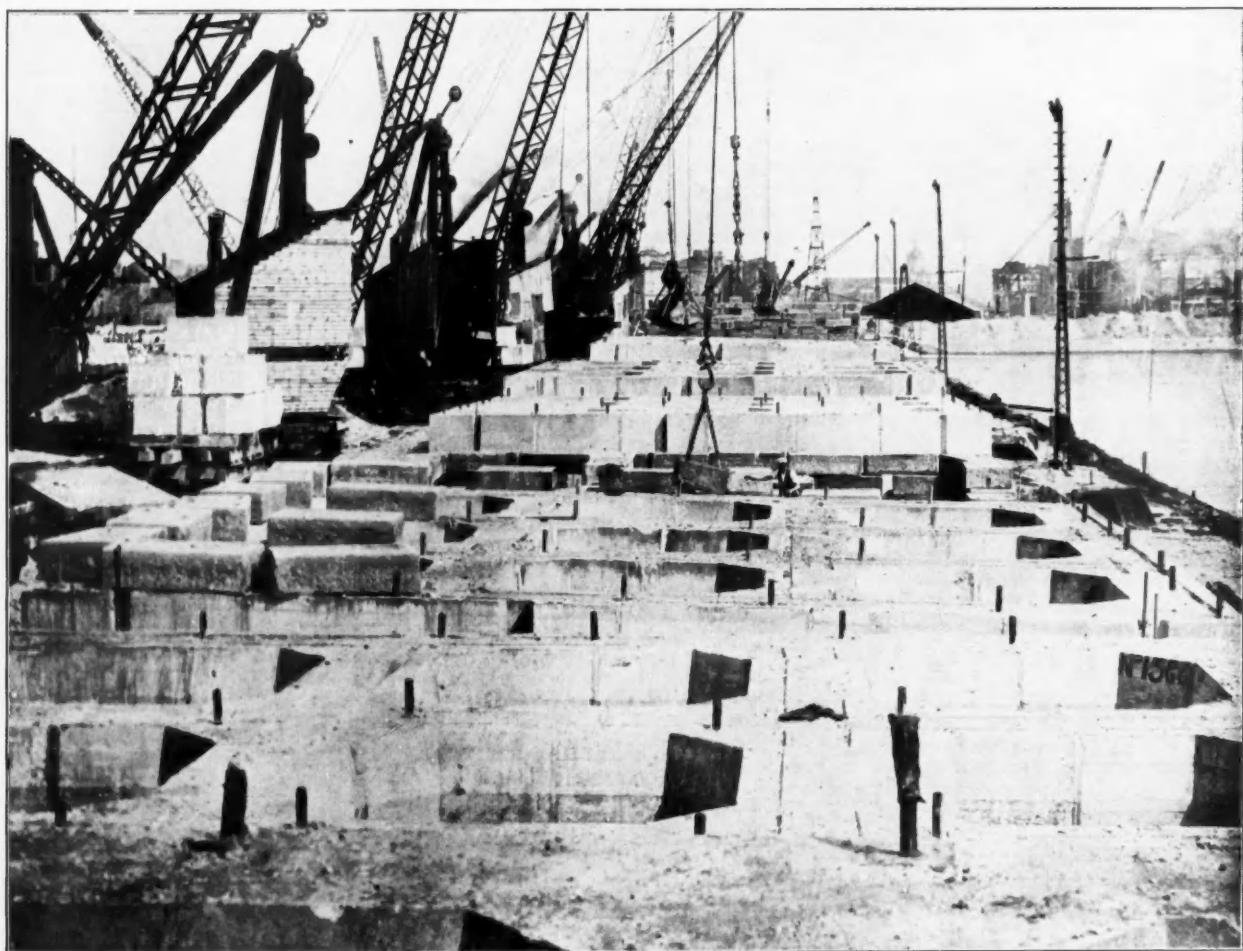
### Obituary.

It is with deep regret that we have to announce the death of Mr. Cecil Sainsbury, who passed away on Saturday, September 2nd, after several months of illness. Mr. Sainsbury was Joint Managing Director of Messrs. Stothert and Pitt, Ltd., of Bath, for many years and altogether was with the Company for 43 years.

## *Concrete and its Many Uses in Docks and Harbours*



*Fig. 1. Scarifier for breaking down resistance under the monoliths.*



*Fig. 2. Mono tops showing Wells.*

# Concrete and its Many Uses in Docks and Harbours—IV

By W. A. LINSKILL, M.Sc., A.M.Inst.C.E.

## WET DOCKS.

Concrete Monoliths.  
Concreting under water.

## HARBOURS.

Concrete Breakwaters.  
Concrete in bags.  
Concrete Blocks.  
Concrete Caissons.

### Wet Docks

#### Concrete Monoliths.

THE concrete dock walls, so far presented in these articles, had good foundations, which gave little or no trouble to their designers and constructors. The dock walls at Liverpool, for instance, are noteworthy in this respect, good rock being found at a convenient level, which obviated any necessity for taking their foundations deeper than the bottom of the dock itself, except for the few feet required to retain the toe of the wall.

Equally good foundations, although this time on ballast, were secured for the two miles of quay walls of the King George V. dock at the Port of London, at a depth of about 10-ft. below the bottom of the dock.



Fig. 3.

When a good foundation has to be sought at an excessive depth, or where the ground is unsuitable for sinking trenches, either being too waterlogged or actually under water, a form of construction is frequently adopted which consists of sinking monoliths.

A monolith is simply a short length of wall, complete in itself and built upon a steel shoe with a cutting edge. It is sunk by its own weight until it reaches a good bottom or refuses to sink further.

In practice the shoe is assembled on the site where it is proposed to sink the monolith, and the outer walls and cross partition walls are built up to a convenient height. Its weight is now probably sufficient to cause a certain amount of sinkage. By grabbing out or otherwise removing earth from the pockets or wells formed by the partition walls, the monolith sinks still further. As it sinks, the walls are built up and thus kept above ground level. Sometimes the resistance of the ground is sufficient to prevent sinking, in which case extra weight or kentledge of 1,000 tons or more may have to be added, usually in the form of cast iron blocks. This weight reached a maximum of about 1,000 tons in the case of the monoliths at the Tilbury Docks extensions, and 4,500 tons on those in the new quay wall at Southampton. In our first illustration, which shows some of the Southampton monoliths, the iron kentledge will be noticed on the extreme left and right of the picture. The ground under a corner of the centre monolith is being broken up by the contrivance shown.

When a monolith tends to sink unevenly and to get out of a vertical position, kentledge is added to the high side, which helps to correct this fault, or at least to check it.

Except where brickwork is used, the walls of monoliths are constructed of concrete, usually in the form of pre-cast blocks. These for convenience of handling may be of about five tons weight, and for resisting external pressure usually have radial joints, the joints being broken by each successive course of blocks. Illustration No. 2 shows block setting and grabbing operations.

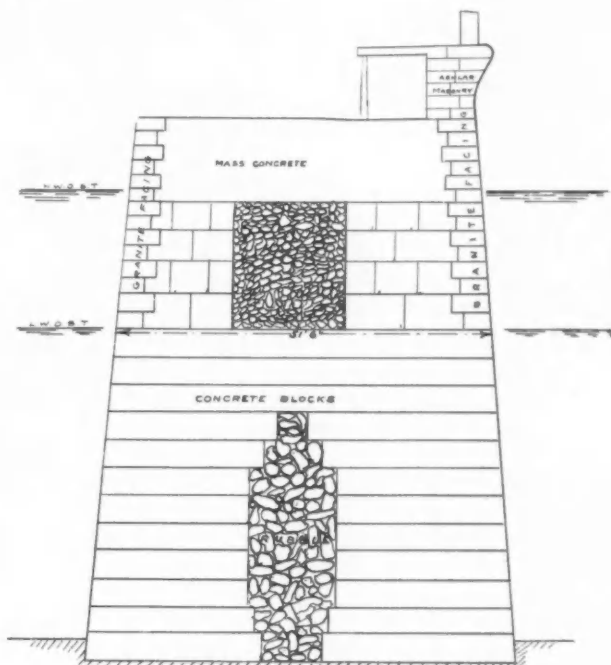


Fig. 4. Concrete Breakwater, Dover Harbour.  
An interesting combination of mass concrete, concrete blocks, masonry and rubble-heating.

When the monolith has reached the required depth, and has found a sufficiently good foundation, the bottoms of the wells are sealed with a layer of good concrete backed with a few feet of weaker concrete. The remainder of the wells may be filled with weak concrete, sand or earth. In most instances the front wells are left empty above the seal, in order to reduce the pressure on the toe of the monolith.

Various shapes, on plan, have been tried for monoliths, as for example the triple-cylinder type adopted at Princes Dock, Glasgow, about 1875, and the rectangular shape, 30-ft. long and 21-ft. wide, at Rothesay Dock, Glasgow, about 1900. This type had six wells. Then there are also the double octagonal, the double hexagonal, etc.

But the square type now appears to be the one most favoured, and has been used in recent work. The size varies from 30-ft. square with four wells, as used in the Tilbury Docks extensions, 1912-1916, to 45-ft. square with six wells in the monoliths sunk for the new quay wall at Southampton.

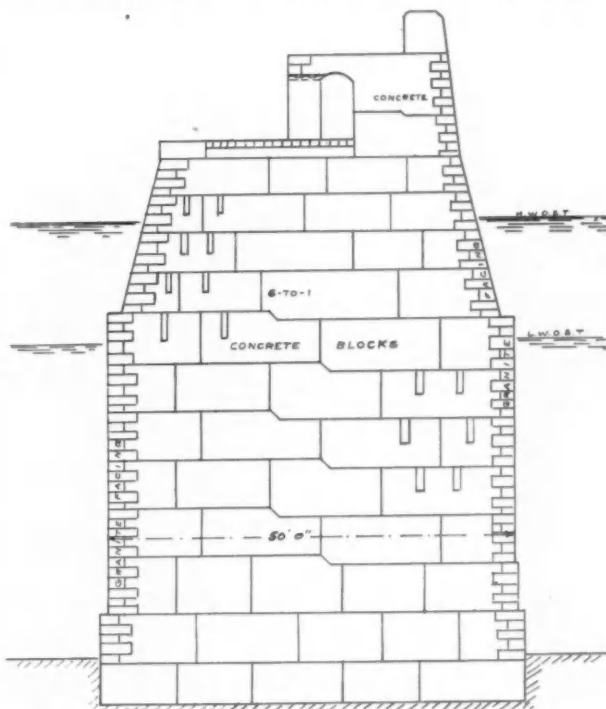


Fig. 5. North Tyne Pier. Typical Concrete Breakwater.

## Concrete and its Many Uses in Docks and Harbours—continued

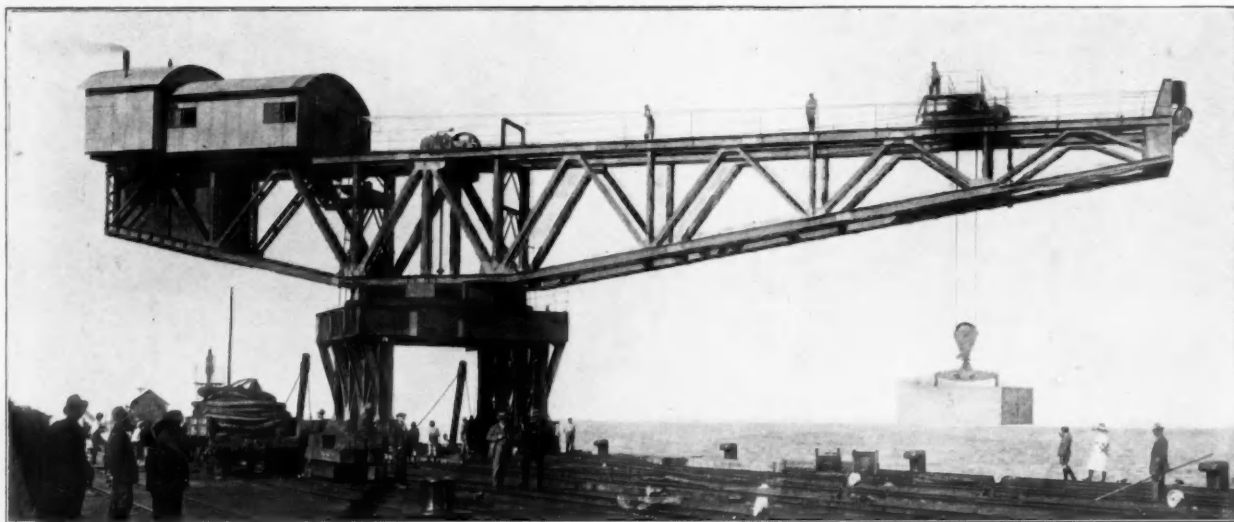


Fig. 6.

In the former case the monoliths were 40 to 50-ft. deep and in the latter were 80 to 100-ft. deep.

Concrete monoliths used on the construction of Rosyth Dockyard were 43-ft. square and each contained four wells. They were sunk to varying depths up to a maximum of about 90-ft.

At Tilbury Docks the shoes of some of the monoliths were themselves formed of reinforced concrete. This is shown in Illustration No. 3.

After a series of monoliths has been sunk on the line of a quay wall, the well holes, if open, are covered with reinforced concrete slabs and the wall is completed to coping level in mass concrete.

### Concreting under Water.

During the construction of the White Star Dock at Southampton in 1907, trouble was experienced in one of the wall trenches by a burst in of water, which rendered it impracticable to proceed with the excavation in the usual way. The method adopted for getting over this difficulty illustrates a new use for concrete.

Rectangular boxes of reinforced concrete were made of about 17-ft. in length and 8-ft. wide by 16-ft. deep. The walls were 18-in. thick and there was a cross wall 1-ft. thick, which helped to stiffen the side walls. There was, of course, no top or bottom.

These boxes or caissons were lowered down between the timbers in the trench until they reached the bottom. Divers then excavated the ground inside them until the caissons had sunk down to the required depth, when they were filled with concrete deposited under water from boxes having bottom doors.

On the top of these caissons divers placed large pre-cast concrete blocks at the front side, and when these blocks had been backed with a layer of concrete the trench was pumped dry and the wall built in the usual way.

## Harbours

### Concrete Breakwaters.

Of the many weighty problems which engage the attention of the civil engineer and form part of his work in dealing with the forces of Nature, few give him more anxiety than those connected with the construction of a breakwater that shall successfully withstand those particular forces of Nature which tend to wreck the structure through the destructive medium of a rough sea.

If it were simply a matter of resisting a horizontal pressure due to wave action, although this has been known to exceed 6,000 lbs. per super ft., it would be easy to give the breakwater sufficient width and mass to prevent it either being overturned or pushed back.

But wave action has a far more serious and damaging effect. It can throw many tons weight of falling water on top of the wall, and immediately following such a hammer blow the wave recedes from the face of the wall, its downward rush increasing the disintegrating effect on the materials of which the wall is built.

An ideal wall to withstand such destructive action should be monolithic, without joint or weakness, and composed of some substance sufficiently hard to resist erosion. A carefully built mass concrete wall fulfils these requirements, and also possesses further advantages. It can be given a smooth face, of any required shape which may be considered best fitted to meet the waves under given conditions.

There is, however, a difficulty. The foundations of breakwaters and harbour walls are not above water level even at low tide.

In the instance given previously of the deposition of mass concrete in water, the water was calm and without movement.

This necessary condition is unobtainable in tidal water near the coast, where there is almost continuous movement of the sea even in the calmest weather. A current in the water tends to wash away the cement and disintegrate the concrete, and it is difficult and costly to ensure good results unless special precautions are taken, and any wastage of concrete made good.

### Concrete in Bags.

One method of overcoming the difficulty was to deposit the concrete in large bags containing 50 to 100 tons each. Instances of this are the breakwaters at Aberdeen, where in 1870 the foundations consisted of 50-ton bags of concrete; a breakwater at Newhaven where 100-ton bags were used; and the two breakwaters sheltering the approach to the Sunderland Docks, where the foundations consisted of banks formed of bags of concrete weighing 116 tons each.

This type of foundation has advantages over the mound of rubble stone which was the earliest form of breakwater, but which was always liable to damage by wave action.

Where the sea bed was rock, it was sometimes levelled off by divers and the wall built directly on the rock, or alternatively the hollows in the rock were filled with mass concrete by divers. This was the case at Seaham Harbour, where the rock bottom was very uneven; 4-to-1 concrete was deposited under water from skips and levelled off by divers. There was great wastage of concrete, in extreme cases beds having to be screeded three times before building could be commenced.

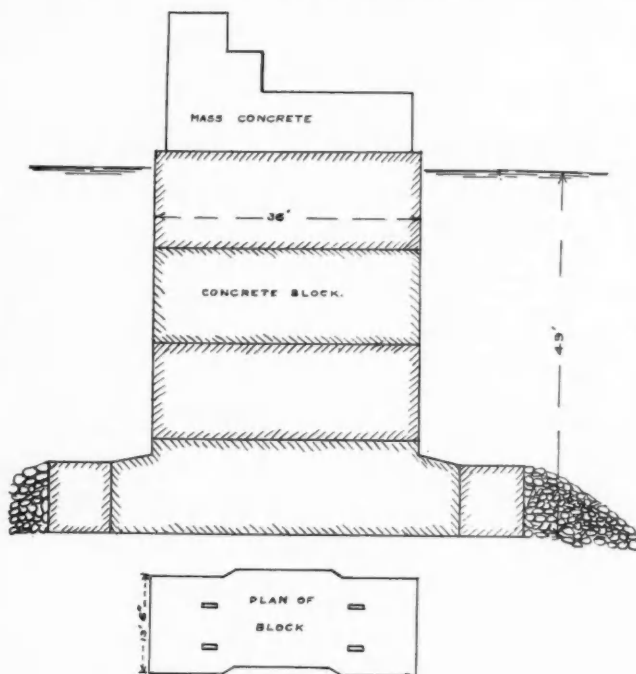


Fig. 7. Breakwater built of 400-ton Concrete Blocks.

## Concrete and its Many Uses in Docks and Harbours—continued

In the case of the North Pier breakwater at the entrance to the River Tyne, the foundation was on shale which was levelled off by divers and the wall built direct upon the shale.

### Concrete Blocks.

In the instances referred to the concrete breakwater, whether built on a foundation of concrete bags or direct on the sea bed, was built of pre-cast concrete blocks varying in weight from 12 to 40 tons, up to quay level, above which, mass concrete was used as hearting for the parapet. In the case of the Dover breakwater, the mass concrete hearting commenced about high water level, shown in Fig. 4.

It is usual to mould the concrete blocks with projections and recesses so that they interlock when laid.

On account of its exposed position, the Tyne North Pier was faced with granite, the facing stones being built into the blocks when they were moulded. Opinion was divided at the time (about 1900) as to the necessity of this facing. It was pointed out that concrete could be brought to a smooth, hard face which would offer less resistance to wave action and would possess satisfactory wearing qualities. The blocks were made of 6-to-1 concrete. A cross section of this pier is shown in Fig. 5, reproduced by the courtesy of Messrs. Coode, Wilson, Mitchell and Vaughan-Lee.

Where there is a good foundation of rock, the concrete blocks are usually set on horizontal beds, but where there is any possibility of settlement it has been found an advantage to build them in a sloping position inclined at an angle of about 70 deg. These blocks, of course, break joint with each other, and are further bonded together by suitable interlocking projections and indents. The breakwater at Madras Harbour is an example of this type.

Thirty to fifty tons may be described as normal weights for concrete blocks used in breakwater construction, but their weight is only limited by a consideration of the cost of handling and setting them, for which a special type of crane is required.

\* Illustration No. 6 shows a "Titan" crane used for block setting at Port Elizabeth. This particular crane is capable of lifting 50 tons at 70-ft. radius, or 40 tons at 85-ft. radius. The total weight of machine is 355 tons.

Any great increase in the weight of blocks would necessarily increase the outlay on more powerful lifting plant.

Larger concrete blocks, however, have been made and used in certain cases where circumstances doubtless justified such use.

At the Port of Dublin concrete blocks weighing over 350 tons each were used for the lower portion of a quay wall.

In the construction of a breakwater at Algiers, 400-ton blocks were used, and each block formed a through course from front

to back of the breakwater. Fig. 7 gives a cross section of this breakwater.

Italian engineers favour the use of these large blocks and have devised special floating cranes to lift them. In one case, concrete blocks 550 tons weight were floated and set by means of pontoons, coupled together with the block suspended between them.

### Concrete Caissons.

Yet another method of building concrete breakwaters remains to be described, and this is to use floating caissons. These may be either built on a slipway from which they are launched into the water, or in a dry dock and floated out. They are towed to the site of the breakwater and there sunk on to a previously prepared bed.

The caissons used for the Zeebrugge breakwater were of iron lined inside with concrete. After being sunk into their correct position they were filled with concrete, deposited from skips in the water enclosed in the caisson. The size of each was about 82-ft. long, 29-ft. 6-in. wide and 29-ft. high, the top being about 3-ft. above low water. Thus the last layer of concrete was put in in the dry and formed a good foundation for the concrete blocks which were used for the remainder of the breakwater.

An improvement upon this method was adopted for a portion of the breakwater at Valparaiso Harbour, where the caissons were themselves constructed of reinforced concrete, and were divided by five partition walls into six compartments. It was sufficient to flood four compartments in order to sink the caisson—the fifth and sixth could then be filled with concrete in the dry, after which the others in turn were pumped out and filled with concrete.

Owing to the great depth of water, which varied from 59-ft. to 147-ft., and the muddy nature of the sea bed, a rubble bank was first tipped and brought up to about 41-ft. below water. It was upon this bank that the caissons were founded.

They were six in number, 65-ft. long, 48-ft. wide, and 48-ft. deep. When floated, each caisson weighed 2,400 tons, and when filled with concrete the weight was 12,000 tons.

A mass concrete cap about 12-ft. thick covered the caissons and a parapet up to 25-ft. above mean sea level completed the superstructure. A triple row of 60-ton concrete blocks protected the rubble at the toe of the wall.

This method of constructing harbour walls and quays has been used at several ports abroad, a recent case being the extensions to the harbour at the Port of Le Havre.

Reinforced concrete caissons with air locks and a working chamber for use with compressed air have also been employed where it was required to excavate the sea bed and deposit concrete for a foundation. Both types were used on the Marseilles Harbour extensions.

\* The author is indebted to Messrs. Stothert & Pitt for the particulars of the Titan crane and also for the loan of the photograph.

## Port of London Notes

### London's Shipping.

During the week ended September 1st, 1,173 vessels, representing 1,017,255 net register tons, used the Port of London. 605 vessels (835,874 net register tons) were to and from Empire and Foreign ports, and 568 vessels (181,381 net register tons) were engaged in coastwise traffic.

During the week ended September 8th, 1,171 vessels, representing 1,032,720 net register tons, used the Port of London. 553 vessels (838,809 net register tons) were to and from Empire and Foreign ports, and 618 vessels (193,911 net register tons) were engaged in coastwise traffic.

During the week ended September 15th, 1,009 vessels, representing 949,904 net register tons, used the Port of London. 489 vessels (780,411 net register tons) were to and from Empire and Foreign ports, and 520 vessels (169,493 net register tons) were engaged in coastwise traffic.

During the week ended September 22nd, 978 vessels, representing 1,038,595 net register tons, used the Port of London. 592 vessels (852,011 net register tons) were to and from Empire and Foreign Ports, and 386 vessels (186,584 net register tons) were engaged in coastwise traffic.

### Tilbury Passenger Landing Stage.

Sixty-six vessels, totalling 745,970 gross register tons, used the Tilbury Passenger Landing Stage during the month of August, 1933.

Altogether 22,215 passengers were embarked or disembarked at the stage, in addition to baggage and mails.

### The Manchester Ship Canal Company: Staff Changes.

Arising out of the lamented death of Mr. Arthur Alcock, Dock Traffic Superintendent (who was in control of the Dock

Labour and Railways at the Manchester Docks), the following changes have been made.

The positions of Dock Traffic Superintendent and Indoor Superintendent have been abolished. Mr. F. W. Way, Indoor Superintendent, has been appointed Assistant Traffic Superintendent; Mr. C. E. Hutchinson has been appointed Dock Railway Superintendent; Mr. E. T. Browning, Superintendent at Ellesmere Port, has been appointed Dock Labour Superintendent; Mr. H. Rycroft has been appointed Assistant Dock Labour Superintendent; Mr. J. H. Hicks has been appointed Chief Tolls Clerk.

### Grimsby New Fish Dock.

Messrs. Sir Lindsay Parkinson and Company, Ltd., have placed with Messrs. K. L. Kalis Sons and Company, Ltd., of London, a contract for dredging and other work involved in the completion stage of the new dock.

### Blue Star Line Purchase Electric Trucks.

In a reorganisation of their stevedoring arrangements, the Blue Star Line have ordered from Greenwood and Batley, Ltd., Leeds, 45 of their well-known "Greenbat" 2-ton electric trucks for use on the quays used by this line on the London Docks.

### Opening of New Harbour at Vizagapatam.

The new harbour which has been under construction at Vizagapatam is now nearly completed and will be opened for traffic early in October.

The new harbour will be open for vessels from half an hour before sunrise until half an hour after sunset and will be capable of taking vessels up to 26-ft. draught.

Pilotage and the attendance of a port tug will be compulsory and no lighterage arrangements for vessels lying in the Roads will be available after the harbour has been opened.

The accommodation in the new harbour comprises three quay berths and three off-shore moorings.

## Bombay Port Trust

At a meeting of the Trustees of the Port of Bombay, held on 25th July, 1933, the following were the main items of business disposed of:—

The Board agreed to share equally with the Municipality the cost of an inquiry by a Judicial Officer proposed by Government in connection with the petition addressed to H.E. the Governor in Council requesting a decision, under the provisions of Sections 518 and 520 of the Bombay Municipal Act, on the question of the liability of the Municipality to provide water mains on Port Trust Estates, the roads on which have not been handed over to the Municipality for maintenance.

An estimate for Rs. 9,471 was sanctioned for renewing with pre-cast concrete slabs certain portions of the floors of Alexandra Dock transit sheds Nos. 3, 4 and 7.

Subject to the approval of the Government of India, the Board accepted the tender of Messrs. J. K. and Cooper Landing Company for the lighterage of American cotton in the Port for a period of three years from 1st September, 1933. The new rates represent a reduction of about 20 per cent. off the current rates.

The Board sanctioned a general revision of the towage charges for dock and harbour tugs sanctioned in October, 1932, representing an annual reduction of about Rs.75,000 in the estimated receipts from towage. This amount has been so distributed as to afford relief to all shipping, but a slightly greater concession is made in the case of coastal vessels by the introduction of a lower scale of towage charges for vessels up to 1,500 tons net register.

Subject to the sanction of Government to the necessary amendment of the Docks Scale of Rates, it was decided that in future wharfage charges on same bottom cargo should only be charged the rates applicable to transshipment cargo and cargo overcarried and landed in the Docks and re-shipped.

Imports and exports at the Port of Bombay:—

	1932 Quarter ended 30th June			1933 Quarter ended 30th June		
	Import Tons	Export Tons	Total Tons	Import Tons	Export Tons	Total Tons
Docks ...	444,945	319,797	764,742	526,936	429,128	956,064
" (trans-shipment) ...	24,777	29,302	54,079	43,976	60,497	104,473
Bundars ...	266,072	55,345	322,417	243,757	57,180	300,937
Total from 1st Apr. to 30th June	735,794	405,444	1,141,238	814,669	546,805	1,361,474

Vessels other than ferry steamers, hired transports, Government vessels and country craft, which entered the Port of Bombay:—

	Quarter ended 30th June, 1932		Quarter ended 30th June, 1933	
	No.	Net Register Tonnage	No.	Net Register Tonnage
Vessels engaged in foreign trade ...	208	902,089	221	967,248
Vessels engaged in coasting trade ...	490	517,288	537	541,946
Total from 1st April to 30th June ...	698	1,419,377	758	1,509,194

At a meeting of the Trustees of the Port of Bombay held on 8th August, 1933, the following were the main items of business disposed of:—

The audited accounts for the year ended 31st March, 1933, were approved for submission to Government.

The Board recorded a note by the Chairman reviewing the results of retrenchment during the year 1932-33. The expenditure was Rs.8.95 lakhs less than the previous year and the lowest since 1922-23.

The Board considered a report by the Marine Committee regarding the proposed levy by the Bombay Municipality of a terminal tax on passengers entering and leaving Bombay and approved the following lines of a reply to Government opposing the proposed tax in so far as it would affect passengers by sea:—

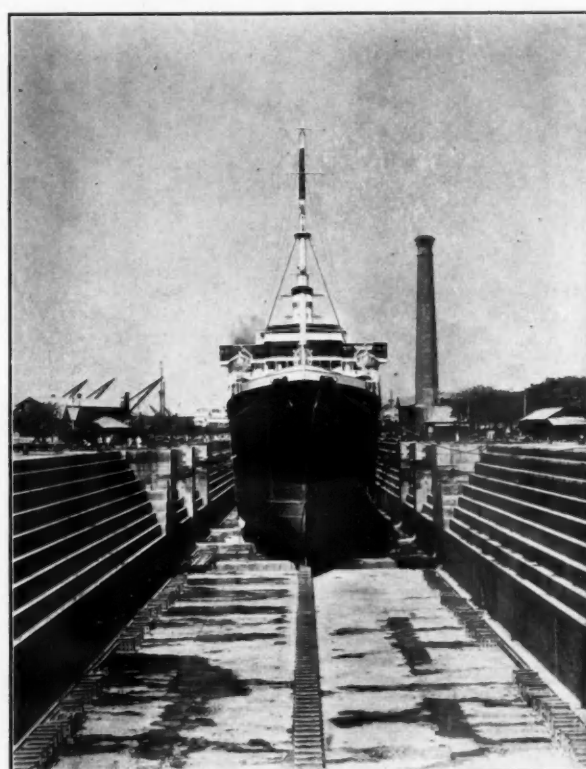
(a) Taxes on sea passengers or their baggage are justifiable only if levied by the Port authority which provides the landing and embarking facilities. There is no justification for the imposition of such taxes by a Municipal or other authority which undertakes no responsibility for the provision of passenger facilities.

(b) Under Section 71 of the Bombay Port Trust Act the Port Trust has to provide such number of free landing places as Government may deem sufficient. The legal effect of this Section in regard to the proposed taxation must be considered.

(c) The Port Trust already impose a charge on the baggage of overseas passengers. A capitation tax in

addition would be resented by the travelling public and would detract from Bombay's popularity as a passenger port. The Port Trust wharfage on baggage is justified by the port facilities provided.

(d) The present heavy impositions on the Trade of the Port in the form of town duties and, particularly, the non-refundable duty on cotton, the majority of which is not consumed in Bombay and derives no benefit from the proceeds of the duty, already trench on the legitimate revenues of the Port Trust.



The Hamburg-America Liner "Resolute" in the Bombay Port Trust Dry Docks. The "Resolute" dropped her starboard propeller and a portion of her tail-shaft in the Mediterranean while on a world tour.

In reply to a reference from Government on the subject of the Bill providing for the protection against accidents of workers employed in loading or unloading ships, which has been framed to give effect to the provisions of a (Revised) Draft Convention adopted by the International Labour Conference in 1932, it was decided to inform Government that the Trustees had no criticism or amendment of the Bill to offer except in regard to the title and scope of the Act.

At a meeting of the Trustees of the Port of Bombay held on 22nd August, 1933, the following were the main items of business disposed of:—

Expenditure of Rs.25,515 was sanctioned for renewing the roofs of Transit sheds Nos. 3 and 4, Victoria Dock, and of Rs.5,000 for the purchase of a portable riveter and a 3½ cwt. non-crucible semi-rotary metal melting furnace for the Work-shops.

The Board decided to invite fresh tenders for the work of loading and unloading cotton bales at Cotton Depot Station with effect from 1st November next.

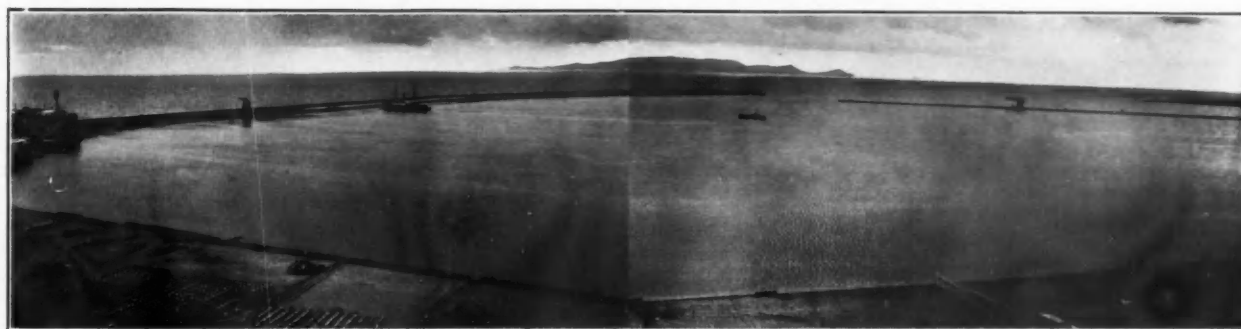
At a meeting of the Trustees of the Port of Bombay held on 5th September, 1933, the following were the main items of business disposed of:—

A supplementary estimate amounting to Rs.97,673 was sanctioned, subject to the necessary sanction of Government, for adapting the 800-ton hopper barge "Spotbill" for use as a drag suction dredger.

A supplementary estimate for Rs.22,000 was also sanctioned for special repairs to Prongs Lighthouse.

Subject to the sanction of Government, amendments of the Bunders Scale of Rates were approved to provide for wharfage on fish landed from motor or other mechanically-propelled vessels up to 50 tons register.

## Near Eastern Port Matters



*The Port of Candia showing the new breakwaters which were completed in 1932.*

**A**CCORDING to statistics which have just been published by the Statistique Générale de la Grece of the Ministry of National Economy, shipping at Greek ports included the following figures during the period from January to June, 1933:—

	1932	1933
Number of Ships Arrived ...	1,435	1,470
Net Registered Tonnage ...	2,496,260	2,593,639
Number of Ships Cleared ...	1,006	1,178
Net Registered Tonnage ...	1,921,497	2,146,135
Total Ships Arrived and Cleared ...	2,441	2,648
Total Net Registered Tonnage ...	4,417,757	4,739,774

There has been, therefore, a total increase of 207 ships representing 322,017 n.r.t., this being made up by 35 ships and 97,379 n.r.t. in arrivals and 172 ships and 224,638 n.r.t. in clearances.

In connection with the situation of shipping at Greek ports, it may be interesting to note that, according to information supplied by the Chamber of Commerce and Industry at Candia, there has been completed in 1932 the construction of the new harbour facilities, which comprised—(1) the construction of a breakwater measuring 980 metres in length and known as the Northern breakwater, and (2) of another breakwater measuring 575 metres in length and known as the Eastern breakwater.

Owing to lack of funds the construction of the quays in the inner harbour, as well as the building of warehouses and electric cranes, has been suspended.

Instead, a new project has been considered rendering possible the enlargement of the harbour with the ordinary income of the port. This project has been planned by Prof. Coen Cagli, and consists of the construction of 1,350 metres of quayage in the interior of the port and a depth of water varying from 8.5 to 9.5 metres. The quayage would have a height of 2.40 metres above sea level. The water surface of the port would

then amount to 46 hectares, and there would be 13 hectares at the disposal of trade. When this project is completed, Candia would be able to handle a traffic of 700,000 tons yearly. It should be noted that at present shipping at Candia averages 120,000 tons yearly, with imports and exports, and 10 per cent. of the trade is with the United Kingdom or the British Colonies.

The question of towage services in the port of Pireaus has been taken up by the Greek Government, and it is planned to establish a Government towage service. On the other hand, the Organismos Limenos Pireos (Pireaus Harbour Authority) has taken up the question of the construction of a maritime passenger station in view of the increasing passenger trade, chiefly due to the larger number of pleasure cruises calling at the largest Greek port. Two positions have been suggested for the situation of this maritime passenger station: firstly, that it should be built in the new port of Pireaus, and secondly, at Phaleron Bay. It is stated that foreign harbour engineers will be invited to give advice on the problem.

According to statistics which have just been published by the Chamber of Commerce and Industry at Split (Jugoslavia), shipping at Yugoslav ports during the past few years included the following figures:—

	TRAFFIC WITH JUGOSLAV PORTS			TRAFFIC WITH FOREIGN PORTS		
	Imports	Exports	Total CENTALS	Imports	Exports	Total
1929	2,637,069	2,800,194	5,437,263	6,183,912	18,283,480	24,467,392
1930	2,568,144	2,461,110	5,029,254	5,259,702	17,880,865	23,140,567
1931	2,357,724	2,919,449	5,277,173	4,798,230	14,932,258	19,730,488
1932	2,171,699	2,671,954	4,843,653	3,316,521	11,730,813	15,047,334

Shipping at Yugoslav ports has considerably decreased in the past few years, and it is most noticeable in traffic with foreign ports, there being a decrease of over 9,000,000 tons in 1932 as compared with 1929. The decrease has been chiefly due to the smaller imports of coal and the smaller exports of calcium carbide and lumber.

## The Port of Halifax : Review of Port Traffic for the Month of July, 1933

### Shipping.

During the month of July, 1933, a total of 548 vessels entered and cleared the Port of Halifax as compared to 512 for July, 1932, and 543 for July, 1931. The net registered tonnage is reported at 479,671 tons as compared to 659,904 tons for July, 1932, and 750,424 tons for July, 1931. The number of vessels engaged in the Trans-Oceanic service entering and clearing during the month of July, 1933, totalled 129 as compared to 134 for July, 1932, and 125 for July, 1931. The number of vessels engaged in Coastwise trade entering inward and outward totalled 419 as compared to 378 for July, 1932, and 418 for July, 1931.

The decrease in the net registered tonnage is largely accounted for by the decrease in the number of passenger liners engaged in the international coastwise passenger cruises from United States ports.

Since January 1st, 1933, the total number of vessels arriving and departing at the Port of Halifax is reported at 3,255 as compared to 3,267 for the same period of 1932, and 3,172 for the first seven months of 1931.

### Cargo Tonnage.

The total cargo tonnage handled inward and outward during July, 1933, is reported at 130,073 tons as compared to 119,287 tons for July, 1932, and 127,300 tons for July, 1931. The total cargo tonnage reported for the first seven months of the year for the Port of Halifax totalled 881,041 tons as compared to 929,894 tons for 1932 and 989,163 tons for 1931.

It is interesting to note that traffic over the Commissioners' Piers reports increases while privately owned properties have continued to show shrinkages from the first of the year. The volume of cargo tonnage moving over the Commissioners' Piers during July constitutes an all-time record, being an increase of 60 per cent. over the average for the previous four years.

Cargo tonnage by major trade routes for the month of June and the first six months of the year show decreases in the South American, West Indies, and Coastwise trades, while increases are reported in Trans-Atlantic, Asiatic, Newfoundland and African. In connection with the trade routes, it is interesting to note that the Trans-Atlantic cargo tonnage for the first six months of the year is reported at 231,591 tons as compared to 168,071 for the same period of 1932 and 133,778 tons for 1931.

### Passengers and Mail.

The total number of passengers landed and embarked at the Port of Halifax during the month of July, 1933, is reported at 4,519 as compared to 9,715 for July, 1932. Since January 1st, the passenger traffic is reported at 15,078 as compared to 22,382 for the first seven months of 1932. The decrease in the number of passengers reported during July is also the result of the dropping off of coastwise passenger cruises from United States Ports.

The quantity of mail handled during the month of July, 1933, is reported at 203 bags as compared to 271 for July, 1932. For the first seven months of 1933, 67,553 bags of mail were handled as compared to 71,688 for the same period of 1932.

## Book Review

**CURS DE NAVIGALIE FLUVIALA SI MARITIMA** (A Course in River and Marine Transportation). By George Popescu, Civil Engineer, Inspector General of Ports and Waterways of Rumania, Professor at the Polytechnical College of the University of Bucharest. In three volumes, 618 p.p., with 280 drawings. The work is published in Rumanian. Publisher: Tipografia, "Vremea," Strada Carol, 10 Bucuresti. 1932.

This work is a very thorough examination of the various engineering works necessary to inland and marine commerce. The reviewer gained a high regard for the engineering ability and practical experience of the author while delegate to the International Navigation Congress at Cairo in December, 1925, both sitting upon a sub-committee concerning port possibilities for petroleum products. There were many conversations aboard the "Imperatul Trian" of the Rumanian National Merchant Marine between Alexandria and Constanza and many more conferences during the time the reviewer was making a survey and study of the ports of Rumania. Professor Popescu's successor, Mr. Vardela, now Director of the Ports and Waterways of Rumania, was the third member of these conferences and inspections. The ports these gentlemen have built for Rumania and the river improvements, especially the bank protection and corrections of the Danube, indicate visibly the high professional knowledge and technical skill of these Public Engineering officials in solving the ports and river problems of their country.

Professor Popescu's book covers the usual topics and their sub-divisions of the general subject matter of inland waterways.

It begins with the general principles of stream flows and the characteristics of the principal waterways of Rumania. Then follows a technical discussion of river hydraulics, the measurement of currents and fluctuations of water levels in streams. Chapters II. and III. discuss erosion, also flow of water in various channel prisms. Chapter IV. deals with bulkheads and revetments, with sketches showing a large number of examples of bulkheads, revetments and short protection structures. This chapter is very full and eventually develops an equally detailed discussion of deep quay walls of harbours, discussing such walls on naturally solid subsoil foundations and upon soft and unstable subsoils. There then follows, with numerous drawings, examples and discussions of many types of quay walls for deep waters, cellular gravity quay walls, solid gravity quay walls, high foundation pile and relieving platform types, etc.

Chapter IV. returns to river banks and river bed control, correction and protection by wing dams and such. Naturally, most of these works cited are from the River Danube, with which Dr. Popescu is most intimately familiar. This discussion, including river dredging, concludes Book I.—213 p.p.

Volume II. frontispiece states that this volume will discuss (1) "free flowing rivers," (2) "canalized rivers," (3) "artificial canals," (4) "marine channels." There follows a considerable collection of mathematical formulæ and a thorough discussion of dams, locks and slack water pool improvements of natural waterways by dams and locks similar to the improved Ohio River in the United States. This leads into a discussion of dams and locks of various types, with elaborate mathematical calculations. Movable dams, including types similar to those on the Mohawk River in New York on the route of the Barge Canal are discussed.

There is a full description with numerous drawings of lock design, also calculations of lateral thrusts against gravity lock walls. The design of lock gates received a full discussion. Lock gates of the mitre and sliding type, also various types of lock valves—Stoney Sector (Taintor), Cylinder, Butterfly, etc. Many types of locks and valves and culvert arrangements are shown. There is no difficulty in reading the drawings. *Ecluse*, "Lock" in Rumanian, is enough like *Ecluse*, French; *Secture Longitudinală*, Rumanian — *Section Longitudinale*, French, to make Rumanian an easy language to follow in this work.

Volume III. The first section of Volume III. covers artificial canals with additional discussion of locks. The following part discusses river navigation and methods of towing on open rivers.

This volume closes with a discussion of the regulation of the Danube, especially the extensive jetties to maintain navigation through the Sulina Mouth. This is the work of an international commission.

The Sulina Mouth is the middle one of three mouths, the Chilia Mouth to the north and St. George Mouth to the south. There are many small mouths between the islands of the Danube Delta. There is a strong littoral current from north to south along the western shore of the Black Sea which continues constantly to drift the sand into the channel. This is in addition to Danube silt. For many years the jetties have been added

to and extended farther into the Black Sea. The Danube from Braila, the last seaport upstream from Galatz, with its three mouths and numerous delta islands, is shown on a very clear map; also sections of the river beds and of the correction jetties at the Sulina Mouth.

A report to the International Danube Commission is included in the book. Popescu recommends a new artificial canal between the Danube proper (above the Delta) and the Black Sea.

Appendix Ia discusses the history of the development of navigation and water transportation in Rumania during the last century. This review gives the tonnage increases by flags and a list of river shipping lines. The discussion of volume of commerce and Danube River fleets of tow boats and barges is too long for review, but the totals are stupendous.

There follows in conclusion a discussion of the economic value of the Danube navigation to Rumania.

Then comes a discussion of the desirability of a canal connection of modern barge dimensions between the Danube and Mosel-Rhine inland waterway systems. The old canal is too small for any practical modern barges.

It is unfortunate that this work is not available in French and English because of the value of this contribution to the field of inland waterways.

The legions of Emperor Trianus certainly left the Latin bases for the Rumanian language of to-day. Anyone with a good knowledge of Latin or French or Italian can get a great amount of information out of Professor Popescu's splendid work in Rumanian by looking for the Latin roots of its language.

There has just been received another elaborate work by George Popescu, entitled "Navigatima Maritima," dealing with the construction, equipment and operation of seaports. This will be reviewed at an early date.

R. S. MACELWEE, B.S., Ph.D.,  
Consulting Engineer, Commander of the  
Crown of Rumania; Author of "The  
Ports of Rumania," published serially in  
*The Dock and Harbour Authority*, 1928-  
29, London; "The Nautical Gazette,"  
New York.

### *Bremen's Seagoing Shipping Traffic during July, 1933.*

In seagoing shipping traffic for Bremen account, 621 vessels with 706,737 net registered tons arrived in July. Thus the number of vessels rose by 22 compared with June. Tonnage, due for the most part to the greater seasonal North Atlantic passenger traffic, increased by 59,790 net registered tons, or 9 per cent. Compared with July, 1932, the number of vessels was 40 higher and the tonnage 31,466 net registered tons higher, equal to 5 per cent.

During the past seven months altogether 3,862 vessels with 4,291,573 net registered tons arrived, against 3,254 vessels with 4,495,697 net registered tons in the same period in 1932. The number of vessels was thus 608, or 19 per cent. more, but the tonnage was 204,124 net registered tons, or 5 per cent., less. The increase in the units was due to the considerably greater traffic of small vessels in the coastal traffic, while the reason for the decrease in capacity can be found particularly in the limitation in sailings, particularly in overseas line service, as well as lessened tramp shipping.

Seaborne goods traffic of the five most important Weser ports was slightly lower than that of June. Imports and exports together, at 367,600 tons, decreased by 8,400 tons, or 2 per cent. July, 1932, on the other hand, was excelled by 20,900 tons or 6 per cent. Imports amounted to 228,800 tons. That is 6,600 tons, or 2 per cent., less than June. Piece goods and mineral oil increased; blubber also arrived; on the other hand, grain and rice showed considerably lower figures. Exports, with 138,800 tons, showed a decrease of 1,800 tons, or 1 per cent. Larger shipments of potash salt and piece goods did not quite counterbalance the decrease in export of coal and scrap. Compared with July, 1932, imports were 36,700 tons larger or 20 per cent.; exports 15,800 tons, or 10 per cent., less.

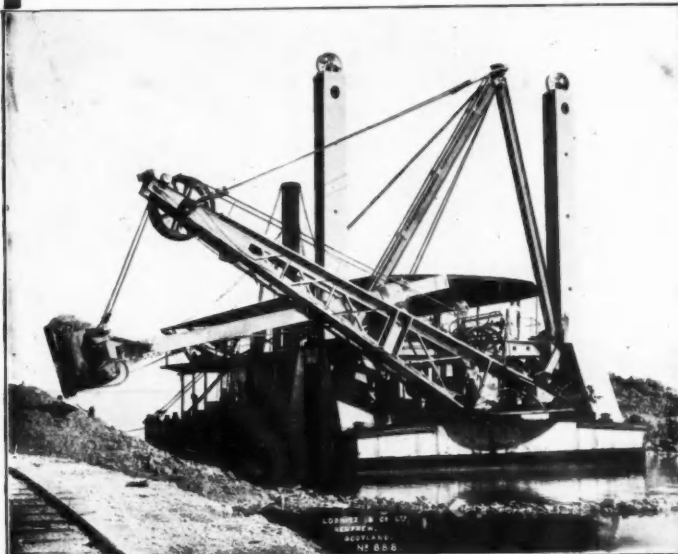
During the first seven months of the year altogether 2,690,500 tons were imported and exported, against 2,614,500 tons in the same period of the previous year. Traffic was thus 76,000 tons, or 3 per cent., larger. The increase falls only to exports, which at 1,059,400 tons, chiefly due to larger coal shipments at the beginning of the year, were 134,600 tons, or 14 per cent., greater. Imports at 1,631,100 tons, were 58,600 tons, or 3 per cent., less. Here the considerable decrease in grain importation above all (227,600 tons, or 48 per cent., less) was the chief cause, which could not be counterbalanced by larger shipments of piece goods, timber, cotton, rice, blubber and phosphate.

# LOBNITZ

Cable Address  
"LOBNITZ  
RENFREW-RENFREWSHIRE."

## DREDGING PLANT

Patent Rockcutters, Patent Dipper  
Dredges, Patent Rock Dredges, Tin, Gold  
and Platinum Dredges, Marine Slipways



Bucket Dredgers, Suction Dredgers,  
Patent Stone Barges, Grab Dredgers,  
Stern Wheel Steamers, &c., &c.



**LOBNITZ & CO. LTD. ENGINEERS AND SHIPBUILDERS RENFREW, SCOTLAND.**

## Dock & Wharf Owners Contemplating Constructions



*Construction of Wharf in Reinforced Concrete for the Wandsworth and District Gas Company  
(See Article in July 1933 issue.)*

WRITE FOR SCHEMES AND ESTIMATES—FREE

THE MOST  
EFFICIENT  
TYPE OF  
WHARF

**A. E. FROST**  
**21, EWART GROVE, WOOD GREEN**  
**LONDON, N.22**

Phone : BOWES PARK 2231

THE MOST  
ECONOMICAL  
SYSTEM OF  
CONSTRUCTION

# Port of London Authority

## Twenty-fourth Annual Report for the Year ended 31st March, 1933

### Trade of the Port

#### Shipping Arriving and Departing.

THE total net register tonnage of vessels that arrived and departed with cargoes and in ballast from and to foreign countries and British Possessions and coastwise during the years ended December 31st, 1919-1932, was as follows:—

	Tons		Tons
1919 ...	26,335,191	1926 ...	49,278,173
1920 ...	32,758,604	1927 ...	52,576,755
1921 ...	34,089,783	1928 ...	55,423,681
1922 ...	39,293,139	1929 ...	57,578,355
1923 ...	41,214,928	1930 ...	58,085,598
1924 ...	45,392,649	1931 ...	56,074,556
1925 ...	47,064,975	1932 ...	53,903,886

#### Imports and Exports.

The values of the total imports and exports (excluding coastwise goods and transshipments under bond) of the United Kingdom and of the Port of London for the year ended December 31st, 1932, were as follows:—

	1932 £	1931 £	Percentage Increase or Decrease on 1931
United Kingdom ...	1,117,715,000	1,315,741,785	15.1
London (including Queenborough) ...	409,371,000	492,400,746	16.9

The tonnage of imports and exports, foreign and coastwise, of the Port of London for the twelve months ended March 31st, 1933 and 1932, respectively was as follows:—

	1933 Tons	1932 Tons	Percentage Increase or Decrease on 1932
IMPORTS—			
Foreign ...	14,449,507	15,719,369	—8.1
Coastwise ...	12,510,072	11,031,749	+13.4
Transshipments ...	1,382,202	1,334,588	+3.6
	28,341,781	28,085,706	+9
EXPORTS—			
Foreign ...	2,796,269	2,716,546	+2.9
Coastwise ...	1,801,610	1,915,102	—5.9
Transshipments ...	1,382,202	1,334,588	+3.6
	5,980,081	5,966,236	+2
Total ...	34,321,862	34,051,942	+8

#### Shipping Paying River Duties of Tonnage.

The total net register tonnage of vessels (including deck cargo tonnage) which, not being within the exempted classes, was liable to river duties of tonnage inwards or outwards during the twelve months ended March 31st, 1933 and 1932 respectively, was as follows:—

	1933	1932	Percentage Increase or Decrease on 1932
Foreign { Inwards	19,518,183	20,877,096	—6.5
Outwards	9,833,645	10,689,828	—8.0
	29,351,828	31,566,924	—7.0
Coastwise { Inwards	7,324,189	6,737,397	+8.7
Outwards	2,627,212	2,485,657	+5.7
	9,951,401	9,223,054	+7.9
	39,303,229	40,789,978	—3.6

There was thus a net decrease of 1,486,749 tons, composed of a decrease of 2,215,096 tons in the foreign and an increase of 728,347 tons in the coastwise trade.

#### Shipping Using the Wet Docks.

Of the above tonnage of vessels that paid river duties of tonnage, 60.1 per cent. used the wet docks of the Authority, compared with 61.4 per cent. during the twelve months preceeding, as follows:—

	1933	1932	Percentage Increase or Decrease on 1932
Foreign { Inwards	13,914,228	14,939,063	—6.9
Outwards	7,525,746	8,207,537	—8.3
	21,439,974	23,146,600	—7.4
Coastwise { Inwards	1,217,266	1,058,495	+15.0
Outwards	958,034	841,835	+13.8
	2,175,300	1,900,330	+14.5
	23,615,274	25,046,930	—5.7

#### Shipping Using the Dry Docks.

The shipping entering the dry docks of the Authority during the twelve months was 303,970 tons more than that of the previous year, viz.:—

1933 Tons gross	1932 Tons gross
3,279,618	2,975,648

#### Goods dealt with at the Docks.

During the twelve months ended March 31st, 1933, the Authority landed or received 2,001,890 tons of import goods for warehousing or for immediate delivery, a decrease of 472,283 tons or 19.1 per cent. on the tonnage dealt with during the previous twelve months.

The stocks of goods at the end of March, 1933, in the warehouses directly controlled by the Authority amounted to 508,824 tons, as compared with 522,335 tons at the corresponding date in 1932, a decrease of 13,511 tons.

The export traffic handled by the Authority on the dock quays during the twelve months amounted to 495,589 tons, being a decrease of 21,887 tons on the previous year's figure of 517,476 tons.

### Finance

#### Borrowing Powers Authorised and Exercised.

The Port of London (Various Powers) Act, 1932, increased the maximum borrowing powers of the Authority by two million pounds to £45,000,000.

The balance of borrowing powers unexercised at March 31st, 1933, amounted to £5,042,042, as follows:—

	£	£
Total amount authorised ...	45,000,000	
Borrowed—		
(a) Port Stock issued and outstanding ...	35,528,450	
(b) Port Stock purchased and extinguished ...	1,062,009	
(c) Port Stock redeemed ...	17,499	
(d) Withdrawn from Stock Redemption Funds ...	3,350,000	
	39,957,958	
Balance of borrowing powers unexercised ...		£5,042,042

#### Port of London Bills.

Bills to the amount of £2,000,000 outstanding on March 31st, 1932, matured on April 22nd, 1932, and were repaid.

#### Temporary Advances.

Temporary advances were obtained during the year, and an amount of £115,000 was outstanding at 31st March, 1933.

#### Capital Expenditure.

The capital expenditure for the year ended March 31st, 1933, amounted to £54,134 16s. 1d.

#### Utilisation of Stock Redemption Funds in Exercise of Borrowing Powers for £650,000.

A sum of £650,000 from stock redemption funds was used for capital purposes in exercise of the Authority's borrowing powers.

#### Cancellation of Port Stock.

The powers conferred on the Authority by the Port of London Stock Regulations have also been exercised by the cancellation of the following Port Stock, representing investments of moneys standing to the credit of certain redemption fund accounts:—

	£	s.	d.
3% "A" Port Stock, 1929-99 ...	69,604	15	6
4% "B" Port Stock, 1929-99 ...	41,600	0	0
3½% Inscribed Port Stock, 1949-99 ...	103,529	5	6
4% Inscribed Port Stock, 1940-60 ...	22,392	14	6
4½% Inscribed Port Stock, 1940-60 ...	352,121	5	6
5% Inscribed Port Stock, 1950-70 ...	25,000	0	0
	£614,248	1	0

#### Stock Redemption Funds and Capital Redemption Account.

The amount standing to the credit of the Stock Redemption Funds at March 31st, 1933, was £531,128 18s. 4d. The investments held on account of these Funds stand in the books at a value of £184,710 18s. 4d., leaving a balance of £346,418 for investment or to be used in exercise of borrowing powers.

*Port of London Authority—continued*

Supplementary to the statutory requirements in regard to Port Stock, provisional Redemption Funds are in operation for the redemption of certain expenditure in respect of which borrowing powers have not yet been exercised. The balance of these Funds amounted at March 31st, 1933, to £122,233 6s. 7d.

The Capital Redemption Account now stands at £3,305,244, representing an increase of £1,107,244 during the year.

**Working Results.**

The following is a summary of the year's working:—

Total Revenue	...	...	...	...	£	5,174,963
Total Expenditure	...	...	...	...		3,848,247
				Balance of Revenue	...	1,326,716
Less—						
Interest on Port Stock and Temporary Loans,						
Sinking Fund Charges, &c., less Interest,						
&c., receivable	...	...	...	...	1,403,910	
Deficit	...	...	...	...	77,194	
Balance brought forward from 31st March, 1932					474,375	
Leaving to be carried forward	...	...	...	...	£397,181	

**General Fund for the Maintenance and Renewal of Premises and Plant and for Dredging.**

The balance standing to the credit of this Fund is £146,255, being a reduction of £38,071, which latter amount represents the expenditure during the year.

**General Reserve Fund.**

The Port of London (Various Powers) Act, 1932, increased the statutory maximum of the General Reserve Fund to two million pounds.

The amount of the Fund stands at £1,000,000. The investments, which are in Trustee Securities, stand in the books at £982,803, which is less than mean market prices at March 31st, 1933, leaving a balance of £17,197 to be invested. Since 1922 the interest on the investments has been credited to Net Revenue Account.

**Insurance Fund.**

This Fund now bears the cost of all the Authority's insurance, whether the risk is borne by the Fund or otherwise. The amount standing to its credit at March 31st, 1933, was as follows:—

Amount at 31st March, 1932	...	...	...	£	625,925
Added since—Income accumulated from Investments					21,869
					647,794
Less—Losses, Reinsurances, &c., during the year	...	...	...	8,800	
Amount at 31st March, 1933	...	...	...	£638,994	

The investments held on account of the Fund stand in the books at a value of £623,725.

**Auditor.**

The Ministry of Transport reappointed Lord Plender, G.B.E., of the firm of Deloitte, Plender, Griffiths and Co., to be auditor of the accounts of the Authority for the year ended March 31st, 1933, in accordance with the provisions of Section 109 of the Port of London (Consolidation) Act, 1920.

**Works and Improvements****Progress of Works.**

Various improvements have been completed comprising structural alterations and the installation of new conveyor plant at the Wool Department, London and St. Katherine Docks, and the reconstruction of quays at East Wood Wharf, Junction Dock, West India Dock, including the replacement of turntables and railway tracks.

The construction of a new quay and jetty on the south side of the Royal Victoria Dock in connection with the erection by tenants of a flour mill is nearing completion.

The more important works carried out for the maintenance of the Authority's undertaking include extensive repairs to lock gates at certain docks, overhaul and repair of quay cranes at Royal Albert Dock and the substitution of underground for overhead electric cables at the Royal Albert and King George V. Docks.

**Dredging.**

During the year, 1,142,230 cubic yards of material were removed from the river in order to maintain and deepen the channels.

The quantity of mud removed from the docks during the same period was 1,081,466 cubic yards.

**General****Reduction in Rates.**

Reduced charges on goods for shipment at the Docks were brought into operation on October 1st, 1932.

**British Exhibition at Copenhagen.**

Arrangements were made for the Authority to participate in the British Exhibition held at Copenhagen from September 24th to October 9th, 1932.

**Lighting of Thames Bridges.**

The Authority adopted a system of uniform lighting of the navigational arches of the Thames Bridges.

**Wreck Service.**

Seventeen vessels were removed from the river by the wreck-raising plant during the year, viz.: 14 sailing vessels and barges measuring 728 tons and 3 small motor boats. In addition, 4 barges measuring 318 tons were removed from the docks.

**Parliamentary: Port of London (Various Powers) Act, 1932.**

The Bill for this Act, the provisions of which were referred to in detail in the last annual report, passed through the various Parliamentary stages as an unopposed measure and received the Royal Assent on June 16th, 1932.

**City of London (Various Powers) Bill.**

A Bill was deposited in Parliament by the Corporation of the City of London to empower them to control and regulate houseboats within the area of the Port of London Sanitary Authority and to require the registration of such craft with the Corporation.

The Bill was amended so as to constitute the Authority the registration authority for this class of craft so far as relates to so much of the area of the Port of London Sanitary Authority as is within the jurisdiction of the Authority, leaving with the Corporation the exercise of powers relating to sanitation and kindred matters not affecting navigation.

**Port of Southampton Topics****Changes in Docks' Staff.**

Important changes in the Docks staff at Southampton have taken place within the past month.

Mr. G. R. Newcombe, who since 1924 has been Docks and Marine Manager, Southern Railway, at Southampton, resigned from the Company's service on account of ill-health, and has been succeeded by Mr. E. J. Missenden, M.B.E., Assistant Superintendent of Operation.

Mr. R. P. Biddle, who has been Assistant Marine Manager at Southampton since 1924, has been appointed Assistant Docks and Marine Manager.

**Increases in Dock Statistics continue during August.**

Each month recently shows increases compared with last year in the various headings under which Southampton Docks traffic is divided.

August continues the good record, and the only side of the port activities where a decrease was recorded was in relation to cargo. In view of the prevailing economic conditions the situation can only be regarded as satisfactory.

The number of vessels inward advanced from 310 to 325 and outward from 299 to 325 as compared with a year ago. The tonnage returns showed a big jump. The gross figure inward was 1,887,083 tons as compared with 1,697,364 tons, an increase of 189,719 tons, while outward there was an advance of 337,113 tons to a total of 1,899,933 tons.

The net tonnage totals were equally satisfactory. The inward figure was 981,780 tons, an increase of 91,274 tons, and the outward figure was 981,096 tons, which was an increase of 162,897 tons.

The passenger figures were peculiar, for there was a decrease of 3,757 outward, but an increase of 7,962 inward. In the aggregate, therefore, the return was satisfactory. The total inward was 51,935 and the total outward 55,130.

The position in regard to cargo was not so pleasing, for although exports advanced by 5,891 tons—the total jumping from 19,842 to 25,733—there was a decrease of 8,900 tons in imports. The total was 39,661 tons as compared with 48,561 tons a year ago.

## Aden Port Trust

The following are the returns for the month of July, 1933, of shipping using the port:—

	No.	Tonnage
Merchant Vessels over 200 tons ...	124	503,977
"    under 200 tons ...	3	496
Government Vessels ...	2	6,176
Dhows ...	43	1,100
PERIM.		
Merchant Vessels over 200 tons ...	22	70,281

### TRADE OF THE PORT.

Article.	Unit	Imports.		Exports.	
		Quantity.	Value Rs.	Quantity.	Value Rs.
Coal ...	Tons	15,216	3,90,377	0	0
Coffee ...	Cwts.	4,847	1,40,617	5,246	2,03,188
Grain, Pulse and Flour ...	"	28,155	1,37,939	14,770	69,656
Gums and Resins ...	"	710	15,623	2,598	45,918
Hardware ...	—	0	14,388	0	25,060
Hides, raw ...	No.	1,324	825	2,758	3,185
Oil, Fuel ...	Tons	43,764	10,94,100	0	0
" Kerosene ...	Gls.	27,968	18,478	10,044	6,452
" Petrol ...	"	3,210	4,013	808	960
Salt ...	Tons	0	0	31,050	2,90,200
Seeds ...	Cwts.	1,957	14,698	236	2,716
Skins, raw ...	No.	529,419	2,68,524	827,484	6,17,945
Sugar ...	Cwts.	27,760	1,66,144	9,433	57,756
Textiles—					
Piece Goods, Grey ...	Yds.	3,620,709	4,73,512	2,726,920	3,51,646
"    " White ...	"	471,493	78,467	265,115	46,794
"    " Printed or Dyed ...	"	871,774	1,77,066	1,086,279	2,40,403
Twist and Yarn ...	Lbs.	127,500	52,341	90,591	38,664
Tobacco, Unmanufactured ...	"	961,996	1,59,495	761,348	1,36,767
" Manufactured ...	"	47,264	40,669	39,094	29,834
Other Articles ...	No. of Pkges.	41,372	7,09,304	13,701	3,01,090
Treasure, Private ...	—	0	2,04,554	0	2,66,740
Total ...	—	—	41,55,134	—	27,34,974

The number of merchant vessels over 200 tons that used the port in July, 1933, was 124 as compared with 113 in the corresponding month last year and the total tonnage was 504,000 as compared with 475,000.

Excluding coal, salt, fuel oil and military and naval stores and transshipment cargo, the total tonnage of imports in the month was 6,800 and of exports 4,000 as compared with 6,400 and 3,400 respectively for the corresponding month last year.

The total value of imports, excluding government stores was

Rs. 41,55,000/- as compared with Rs. 43,99,000/- for July, 1932, and of exports Rs. 27,35,000/- as compared with Rs. 26,62,000/-.

The total value of both imports and exports together was Rs. 68,90,000/- as compared with Rs. 70,61,000/- for the corresponding month last year.

Imports during the month were above those for July, 1932, in the case of grain, pulse and flour, gums and resins, skins raw and sugar, and below in the case of coffee, hardware, hides

(raw), seeds, piecegoods (grey, white and printed or dyed), twist and yarn, tobacco (unmanufactured and manufactured) and treasure (private).

Exports were above those for July, 1932, in the case of grain, pulse and flour, gums and resins, hides (raw), skins (raw), sugar, piecegoods (white, and printed or dyed), tobacco (unmanufactured and manufactured), and below in the case of coffee, hardware, seeds, piecegoods (grey), twist and yarn and treasure (private).

## Ribble Dock Undertaking

### Mr. J. Barron Looks Backward

On the occasion of his retirement from the position of engineer to the Ribble dock authority, the Preston Corporation, Mr. James Barron received from the dock workers the gift of a cheque for a substantial amount and a pair of binoculars. They also handed to him for Mrs. Barron a beautiful diamond and sapphire brooch on platinum.

Acknowledging the gifts, Mr. Barron spoke of the early days of the Ribble undertaking before and after it was taken over by the Corporation, and described how in the time of the first navigation company little was done in the way of works, but some rocks in the river bed near Preston were levelled down and 31 groynes built.

The second company began to make training walls in 1840 more by chance than otherwise. In the next 25 years traffic and revenue dwindled, and there was a scheme for a dock in 1867, but it fell through. It was only after a lot of talk and negotiation that the Corporation bought the undertaking in 1883—fifty years ago.

The Ribble scheme was launched on a wave of great optimism; the dock and basin were built one and a-half times the size that the original Act sanctioned. They were to be big enough to take the world's largest tonnage, and it was as much as a man's life was worth to breathe a word against the scheme. The money borrowed—£650,000—was spent up in five years, and a demand for an additional half million to finish the dock and dredging brought the town to its senses. Ribble Dock was opened in 1892 without an adequate waterway up to it from the sea, and with the knowledge that the training walls would have to be extended from where they ended at

Lytham right through the estuary to the one fathom line at sea.

The trade to Preston before the dock opened was about 40,000 tons a year in and out, and the first full year after the dock was opened brought five and a-half times that amount.

Three and a-half years after Mr. Barron came to Preston, the Corporation resolved to promote a Bill for extending the walls to low water and borrow some money for general purposes and equipment. The walls were begun in the spring of 1906 and the new channel was opened about four years later.

Between 1919 and 1925 the river gained 4-ft. greater depth in the top end, while the walls, without help, had gained 5-ft. at the sea end in the same time. To take advantage of this greater depth near Preston it became necessary to deepen the Bar and, although he kept urging the extension of the walls at the sea end, it was not till 1931 that the Corporation agreed to go on with the work. Now they had begun the final portion of the scheme, which he expected would be as successful as what had already been done.

The Ribble was an excellent training ground. Preston had one of the largest and most varied dredging plants in this country, and there was no port in the world where more wood pulp was discharged in an eight-hour day than at Preston.

"In 15 years from now," added Mr. Barron, "there will most likely be no Ribble rate, and plans for further development will no doubt be brought forward, but I am sure the work done in this past generation will stand good. The channel to the sea, which is the vital thing on which all else depends, has been done in our time and has made the navigation worthy of the name."

